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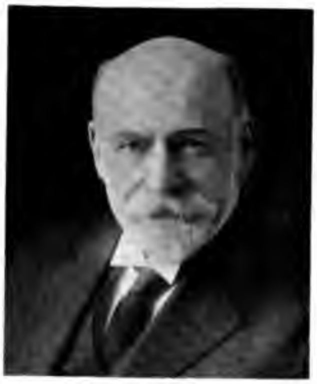

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Queensland.

DEPARTMENT OF MINES.

Queensland Geological Survey.

(B. DUNSTAN, GOVERNMENT GEOLOGIST.)

PUBLICATION No. 215.

CLONCURRY COPPER MINING DISTRICT.

PART I.

WITH 1 PLATE AND 7 FIGURES.

BY

LIONEL C. BALL, B.E.,

ASSISTANT GOVERNMENT GEOLOGIST.

BRISBANE:
BY AUTHORITY: GEORGE ARTHUR VAUGHAN, GOVERNMENT PRINTER, WILLIAM STREET.
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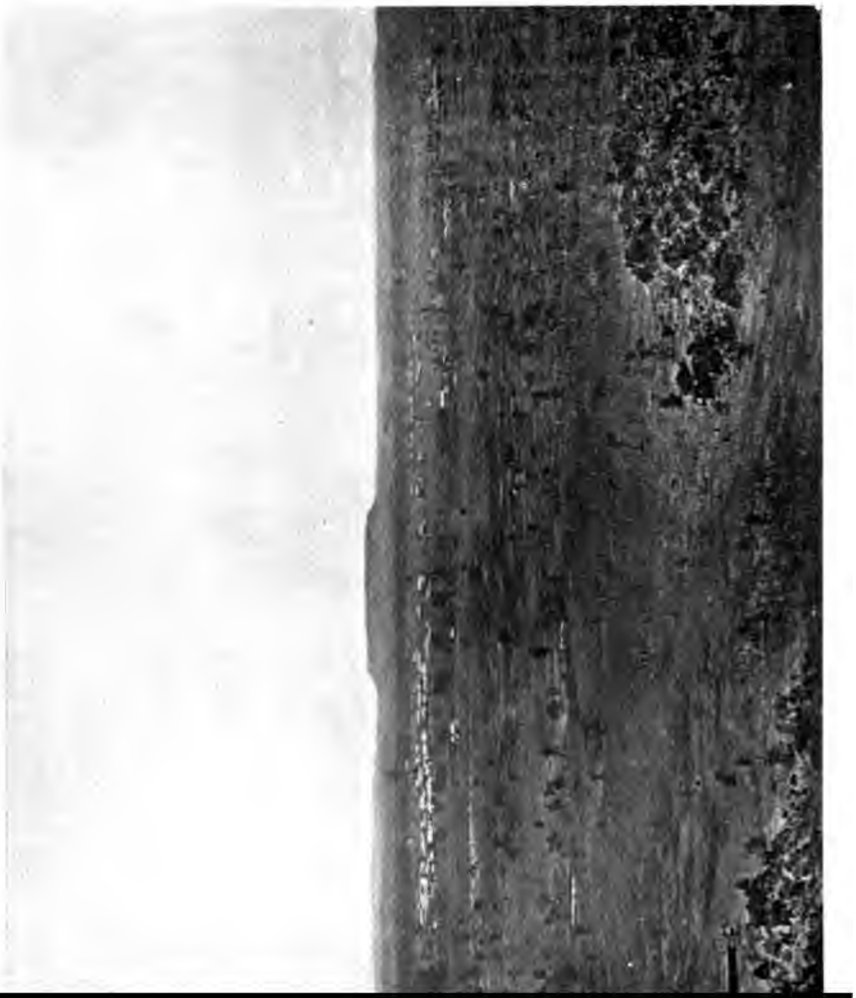


CLONCURRY COPPER MINING DISTRICT.*

PART I.

GEOGRAPHY.

Location.

The township of Cloncurry is situated in the north-western part of Queensland known as the Burke District, on the outer edge of the wide flood plain to the east of the Cloncurry river. Its exact location has been determined astronomically to be in lat. S. 20° 42′ 53″ and long. E. 140° 30′ 20·25″. Burketown and Normanton, the nearest ports, are distant 210 and 215 miles respectively in north-north-westerly and north-north-easterly directions. Townsville, through which most of the trade passes, is, in a direct line, 430 miles to the east-north-east; and Brisbane, the capital, is 900 miles to the south-east by east—in the opposite corner of the State.

The township is situated at no great distance south-easterly from the rolling downs, the strata forming which overlie and hide any lodes which may exist, and hence most of the mining developments have taken place westerly and southerly from the business centre.

Accessibility.

Cloncurry is connected by road with the ports of Normanton and Burketown, whose distances on the map are 240 and 235 miles respectively, and with the Great Northern railway branch termini Richmond and Winton, 183 and 220 miles respectively. The usual route followed by visitors on landing at Townsville is to train to Richmond, 307 miles, or alternatively to Winton, 368 miles, the starting points for coaches leaving twice a week for the field. The quickest way to reach the field from Brisbane is to rail direct to Longreach, and thence coach *viâ* Winton—the time required being five days.

The first section of the Richmond-Cloncurry railway is now under construction, and it is hoped that by the middle of this year it will be possible to rail to within 80 miles of Cloncurry (*i.e.*, to Gilliat), which will leave only one day's coaching.

The Duck Creek, Hampden, Mount Elliott and Duchess are the only mines directly on coach lines, and to reach the others private arrangements have to be made. Every group, and, with the exception of those at the Corella, almost every mine on the field, can be driven to, but in many cases a guide is necessary, as, owing to the slight traffic, the tracks are often indistinguishable. In other cases, such as Mount Oxide, it is preferable to ride across country to making the large detour necessary for the passage of a vehicle.

---

* The author's advance notes on copper mining in the Cloncurry district were published in the annual report of the Under Secretary for Mines for 1906. A brief notice is there given of the form of the deposits and of the extent of the chief mines at the end of that year.

Extent.

The Cloncurry mineral field, as defined by proclamation in the "Government Gazette,"* has an area of 1,724 square miles, is very irregular in shape, and extends 20 miles north-east, 30 miles south-east, 60 miles south-west, and 25 miles north-west of the township. The proclaimed field, however, includes only a small proportion of the proved copper-bearing country, which reaches from lat. S. 19° 30′ to 22°, and from long. E. 139° to 141°. Thus Mount Oxide is 110 miles north-west and Mount Wheeler 25 miles south-east of Cloncurry: the Chatsworth mines are 75 miles south-south-west, and the Yelvertoft 100 miles west-north-west of Cloncurry.

Maps.

The maps hitherto published by the Lands Department include one on a scale of 2 miles to an inch (really a block map) and a later one (published in 1905) on a scale of 4 miles to an inch. The latter is a great improvement, showing as it does the main roads and having many corrections. The 2-mile sheet has also been published by the Mines Department, showing the leases in force at the time of preparation, but the map is now quite out of date, most of the leases having

Topography.

The topography of the Cloncurry district is striking enough to the casual observer, but to the geographer and geologist it has a special significance.

Stretching away for hundreds of miles to the north-east, east, and south-east are the famous rolling downs—vast blacksoil plains clothed with Mitchell and Flinders grasses, the only timber in any quantity, beyond an occasional emu-apple tree, being the lines of coolibah and ti-tree marking the course of a creek or river. The swelling of the surface would scarcely be noticed were it not for the variations in the extent of country within view at different points, the rise and fall being so slight, in fact, that the surface appears to rise in all directions from the observer whether he is in a hollow or on a rise.

The creeks have ill-defined channels, and even the rivers have eaten very little into the plain, which is now at base level, where stream action—as far as denudation is concerned—ceases. The tilted outcropping beds prove that the strata underlying the surface have already been subjected to some degree of denudation—to wit., in the removal of the upper portions of anticlines.

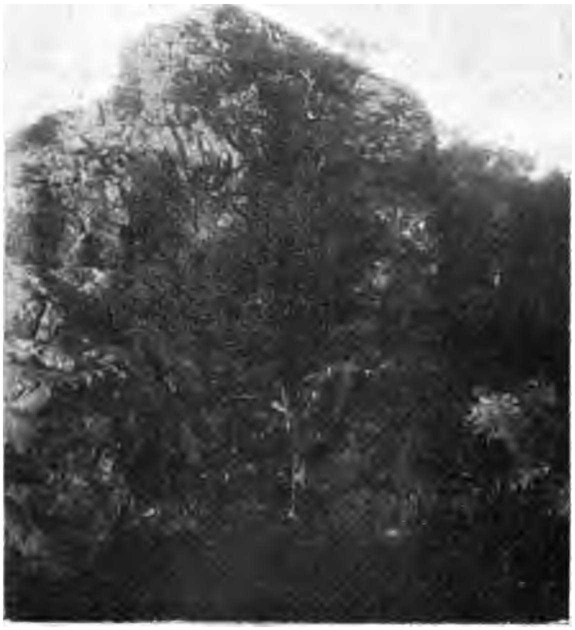
On leaving the downs one comes into a region of worn-down mountain forms, with scattered flat-topped hills, such as Soldier's Cap and Table Mountain. The latter are seen to be approximately equi-altitudinal, and they are undoubtedly the remnants of a former vast peneplain, whose average elevation above the rolling downs may be placed at 1,000 ft. This plain, or plateau, is now in its extreme old age, river valleys, carved out in it, having been widened until separated by only a narrow razor-back or even a row of hills. The prevailing north and south strike of the country has caused the ridges to have the same general alignment, but gaps are fairly frequent in the ranges, and numerous examples can be seen of stream piracy—the capture of the head waters of one stream by a branch from another stream on the opposite side of a range. A specially good example of this is that of the capture of the head of Cone Creek by Slaty Creek, at the Gorge, 20 miles south of Cloncurry. The larger valleys are flat bottomed, and their development is so extensive that we may consider them to mark the youth of a second peneplain near the base-level of the rolling downs.

As to the age of these various land forms, it seems most probable, from the geologic nature of the Cloncurry field, that the schist area is the site of a former mountain tract of some altitude, and that it was from the wearing down of the mountains that the constituents of the strata forming the Rolling Downs (Lower Cretaceous) strata were derived. Part of the Desert Sandstone may also have been formed from the wearing down of the mountain tract, the difference in the petrological character of the two series being due to a changed climate, affording different products of decomposition and to different conditions of deposition (lacustrine as against marine).

The base level of the old plain formed in Cretaceous times was in all probability that of the present rolling downs surface, and incidentally the Desert Sandstone mesas are therefore evidence of elevation of the schist area over which they are scattered. Stream action would again commence after the upheaval with the production first of valleys, then of a peneplain, and ultimately the reduction of the plateau to a plain just above sea-level would be completed. The valleys having been carved out of rocks including some of Desert Sandstone (?) age* they themselves are of necessity younger than Cretaceous; but beyond that no data are to hand to more definitely place them.

The importance of the Cretaceous peneplain and present valley development in connection with the genesis of the Cloncurry ore deposits will be referred to later under the general description of the ore deposits.

into Prospector Creek. The White Gorge is a notch, 150 ft. deep, cut in a range owing its existence to a rib of quartz-veined, silicified slate, between 30 and 40 ft. in thickness. A notable feature of the gorges is that there is generally a fine pool of water below the rock-bar, which is in process of being cut through. These pools have been often for months the sole supply of water for miners in the vicinity. The holes are produced by the scouring action of the stream falling from the bar in time of flood, and it is probable that the supply of water is augmented to some extent by seepage from the slates adjacent to the silicified rock.



[*L. C. B., photo.*

FIG. 2.—WHITE GORGE, PROSPECTOR CREEK, VIEWED FROM THE NORTH.

The south-western branch of the Six Mile (Leichhardt) Creek occupies one of the few transverse valleys seen in the Cloncurry district. The stream would, therefore, appear to be consequent—the uplifting of the country at its head having produced abundant fall and capacity for stream action. McKean's Gorge forms the exit of the valley at the lower end, and is characteristic, the stream, owing to silicification of a certain band of country, having been able to cut out only a narrow passage since the hardened rock was encountered.

When viewed from one of the higher mountains, such as Mount Bornite, which rises 380 ft. above Six-mile Creek, the region is plainly seen to be a dissected plateau, flat-topped remnants being best preserved to the south-west of Mount Cuthbert, while to the north-east and east erosion has reduced the ranges to rows of sugar-loafs, separated by wide flat-bottomed valleys, like that of the eastern branch of Six-mile and Copper-mine Creeks.

The existence of a peneplain at the head of the Cloncurry River is indicated by the flat-topped hills and ridges between Mount Elliott and Devoncourt station.

Population.

It is difficult to arrive at any reliable estimation of the population of even the township, owing to the large floating element. Sub-Inspector Quilter, at the end of 1906, placed the total population of the whole district—say 80 miles radius from the township—at 2,000; and that of the township and within 10 miles radius at 800. The Warden, however, estimates the total population at only 1,089.*

Climate.

The climate of the Cloncurry district is reported to be all that could be desired during the winter months, but from the beginning of October to the end of March it can only be described as trying in the extreme—the temperature varying between 55° and 115° Fahr. Thus in October last the maximum and minimum readings† were 103·1° and 53·8°; in November 104·8° and 62·4°; in December

GENERAL LITERATURE.

(1) Reports on the *Cloncurry District*, by the Wardens in the Annual Reports of the Under Secretary for Mines and in the "Q.G.M. Journal."

(*a*) Reginald C. H. Uhr ...	... 1878 to 1885.
(*b*) C. D. Keane	... 1886
(*c*) W. Samwell	... 1887 to 1888
(*d*) John D. Gibson ...	... 1889 to 1891
(*e*) Richd. Riley	... 1892 to 1894
(*f*) T. H. Boddington ...	... 1895 to 1897
(*g*) Wm. W. Alder ...	... 1898
(*h*) J. C. Linedale	... 1899
(*i*) Jas. Bracewell	... 1900 to 1902.
(*j*) F. J. Cherry	... 1903 to 1906
(*k*) J. C. Linedale	... 1906 & 1907.

While these reports have been very useful in compiling the output and working up the history of the field, there are unfortunately many breaks, and as no uniform method of reporting returns has been in force, it is impossible to obtain from this source a complete record of the output of the different mines of the field.

(2) Six reports on *the geological features of part of the district to be traversed by the proposed transcontinental railway.* By Robert L. Jack, Govt. Geologist. Bris.; By Auth.: 1898. No. 136 (reprint of No. 10 published in 1885) of the Geological Survey Publications.

Descriptions of lead deposits at the Dugald, iron at Mount Leviathan, and gold at the Gilded Rose, Top Camp, Tip Top, and Pumpkin Gully will be found in this report besides accounts of copper deposits on the Dugald, at the Great Australian, Mt. Douglas, and Pumpkin Gully, Slaty Creek, Duck Creek, Argylla, Crusader and Dobbyn, and Mountain Home.

(3) Report on *the Leichhardt Goldfield and other mining centres in the Cloncurry District.* By William H. Rands, Assist. Govt. Geologist. Bris.: By Auth.: 1895. G.S.Q. Publication No. 104.

Full particulars of developments at the Bowerbird (Leichhardt), Gilded Rose, Soldier's Cap, Pumpkin Gully, Top Camp, Last Call, Bell's Camp, and Tip Top (Agate Downs).

(4) *Recent Developments in the Copper-Mining Industry in the Cloncurry District.* By Walter E. Cameron, B.A., Assistant Govt. Geologist. Bris.: By Auth.: 1900. G.S.Q. Publication No. 153.

Including general geology and descriptions of the Great Australian, Hampden, Chinaman, Mount Elliott, Mount Oxide, Coolullah, and Crusader lodes and the Pilgrim Creek, Pumpkin Gully, Dugald River and Palmtree Creek leases.

(5.) Report on the *Hampden Mines.* By John Godkin, manager. 1901.

Not available.

(6) Report on the *Hampden Copper Mines.* By F. Stanley Low, B.C.E., late manager. Dec., 1900. Published in the prospectus of the Hampden Cloncurry Copper Mines, Ltd. (See below.)

(7) "*Copy of report on the principal Copper Properties at Cloncurry,*" North Queensland. By W. P. Rutherford, Jnr., A.R.S.M., A.Inst.M.M., and Mr. Kitchener (Brother of Lord Kitchener). July, 1904. Lon.: Morton and Birt.

The report is almost without exception condemnatory.

(8) *The Cloncurry Copperfield, Queensland.* Special report on its ores by Thomas Gibb, A.R.S.M. "Q.G.M., Jour.," Nov., 1904.

"The ores from the point of view of their metallurgical treatment, with local condition of economical bearing." The deposits referred to are those at Slaty Creek, Duck Creek, Malbon River, and at Hampden.

(9) Report on *the Hampden Mine.* By A. E. Savage, Resident Manager of the Australian Smelting Corporation, Ltd. Feb., 1906. Published in the prospectus of the Hampden Cloncurry Copper Mines, Ltd. (See below.)

(10) Report on *the Mount Elliott Mine,* Cloncurry. By G. A. Waller, one of the Directors. June, 1906. "Walsh and Tinaroo Miner." (See below.)

(11) *With the Premier,* a series of articles by C.A.B., in the Brisbane "Courier" during June, 1906.

HISTORY.

1870.—Messrs. Henry Sheaffe and McPhail were among the best known of the early copper prospectors in this district, much of their work having been done prior to 1870. They first took up many mineral selections under the Mineral Act of 1872, and converted most of them into freeholds.

1880.—The first official Cloncurry report available to me, written in 1880, refers to the securing of many lodes at Duck Creek, Fisher's Creek, the Williams, Dugald, and the Leichhardt Rivers. At about this time an English syndicate made a proposal to build a transcontinental railway, passing through the Cloncurry District, but failed to obtain Parliamentary sanction.

1881.—Additional discoveries were made in 1881, but the prospectors were " debarred from securing the land " (Warden Uhr). Mr. (now Dr.) Robert L. Jack, Government Geologist, made a geological examination of the field in this year, in conjunction with the Transcontinental Railway Survey Party under the direction of Major-General the Hon. W. Fielding.

1882.—There was no official information from the field in 1882 and 1883, but a report by Mr. Geo. Phillips on a railway from Cloncurry to Normanton was published.

1884.—The first mining leases were granted by Warden Uhr in January, 1884—the Eureka and United copper lodes in the Hampden district, the Lady Musgrave and Cave Hill in the Pilgrim Creek district, and the Ironclad at the Florence River. In the same year the Great Australia Company began operations, and during the following three years smelted locally the ore raised, but in 1889 closed the mine down, allegedly because of the low price of copper.

1886.—In 1886 the plans for the Cloncurry-Normanton line were adopted by Parliament, but construction was not begun, and the grant was transferred to the Croydon line.

1890.—The year 1890 was marked by several discoveries by Henry in the Leichhardt River district, but then for seven years nothing was done, owing to the low price of the metal.

1898.—Prospecting again became the order of the day, especially at Pumpkin Gully and at the Hampden, after the passing of the present Mining Act in 1898. At the latter place a Melbourne syndicate, during this and the following year, energetically carried out the prospecting of the reward claim.

1899.—A great many mineral areas were applied for, but very little work was done on any of them.

1900.—Option syndicates were formed to test Mount Elliott and Mount Cuthbert.

1901.—Work ceased at Hampden and Mount Elliott, and little was being done elsewhere, owing to the low price of copper. Parliament in 1901 passed a Bill authorising the construction of the Cloncurry-Normanton Railway by private enterprise, but the syndicate concerned made no move, and its deposit of £10,000 was forfeited in January, 1906, after the Government had decided to continue the Richmond line.

1902.—Drought retarded operations.

1903.—The Goldfields of Matabeleland, Ltd., negotiated for the purchase of Duck Creek leases. The chief work done was at the Hampden, Duck Creek, and Coolullah Mines, but the quantity was inconsiderable, because of uncertainty as to the intentions of the railway company.

1904.—There was considerable activity all over the field, owing to a good season.

1905.—Drought. The chief events were the sale and the opening up of Mount Elliott. Work was also begun on the Willcocks Cloncurry Copper Syndicate's properties at Duck Creek.

1906.—The high prices ruling for copper during this year caused unusual activity in prospecting and mining. Towards the latter part of the year several companies were formed to develop certain of the deposits, but at the present time there is a lull in the excitement until definite results have been obtained.

MINERAL HOLDINGS.*

Mineral lands are now held in the Cloncurry District as freehold, as leasehold, as claims, and as prospecting areas. The freeholds were [redacted]

ECONOMICS.

Total Production.

The figures given below have been taken from the annual reports of the Under Secretary for Mines, the returns for years prior to 1898 being unavailable:—

1898	5	tons ore, valued at	£112		
1899	2	,, ,,	£145		
1900	13	,, ,,	£780		
1901	236	,, ,,	£14,868		
1902	51	,, ,,	£2,550		
1903	148	,, ,,	£8,584		
1904	1,336$\frac{5}{20}$	,, (30 %) ,,	£23,560	0	9
1905	1,521$\frac{17}{20}$	,, ,,	£32,876	14	4
1906	2,524$\frac{12}{20}$	,, ,,			
1907	1,924$\frac{6}{20}$ [1]	,, (30 %) ,,			

[1] Including 597 tons smelted at the Great Australia.

Monthly outputs during the year 1907[2] were as follow:—

	Tons.		Tons.
January	92·20	July	354·00
February ...	117·30	August	111·00
March	104·55	September ...	85·78
April	64·00	October	109·70
May	98·60	November ...	525·65 [3]
June	164·50	December ...	97·00 [3]
			1,924·28

[2] Compiled from the Warden's monthly reports.

[3] Smelted at the Great Australia.

Costs.

The ore hitherto exported has, it is believed, contained an average of 30 per cent. copper. Very little running under 20 per cent. has been sent away, as claim-holders in this part expect, on account of the roughness of the life, much more than would be considered good wages in the settled areas.

The following statements of cost are approximate, but will give an idea of the difference caused by the completion of the railway connecting Cloncurry with Townsville:—

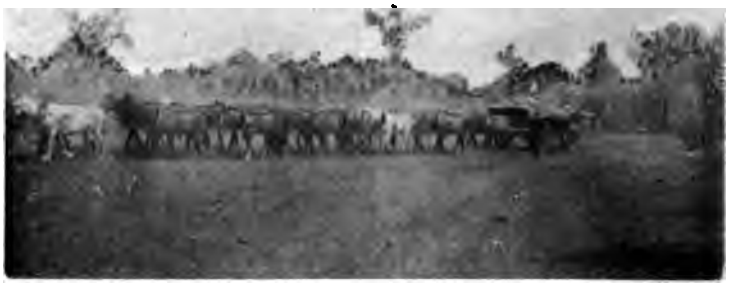
	£	*s.*	*d.*	
Cartage from mine to Richmond	8	0	0	per ton
Railage, Richmond to Townsville	0	17	6	,,
Wharfage, etc.	0	2	0	,,
Freight, Townsville to Newcastle	0	11	0	,,
Treatment (uniform charge)	1	16	6	,,
,, (1s. per unit, 30%)	1	10	0	,,
	£13	17	0	

Cartage from mine to Cloncurry	2	10	0	per ton
Railage, Cloncurry to Townsville	1	4	6	,,
Wharfage, etc.	0	2	0	,,
Freight, Townsville to Newcastle	0	11	0	,,
Treatment (uniform charge)	1	16	6	,,
,, (1s. per unit, 20%)	1	0	0	,,
	£7	17	6	

Mining costs may vary from 10s. per ton upwards, and the other expenses being practically constant, they naturally determine the amount of profit. The bunchy occurrence of the ore necessitates much dead work, and, though the cost of sinking or driving per foot may be comparatively low, the expenditure per ton of shipping ore is always high.

Transport.

Most of the transport is by horse team drawing heavy fou wheeled wagons. Early in 1906 carriage from Mount Elliott t Richmond (240 miles) cost £4 10s. per ton; by the middle of th



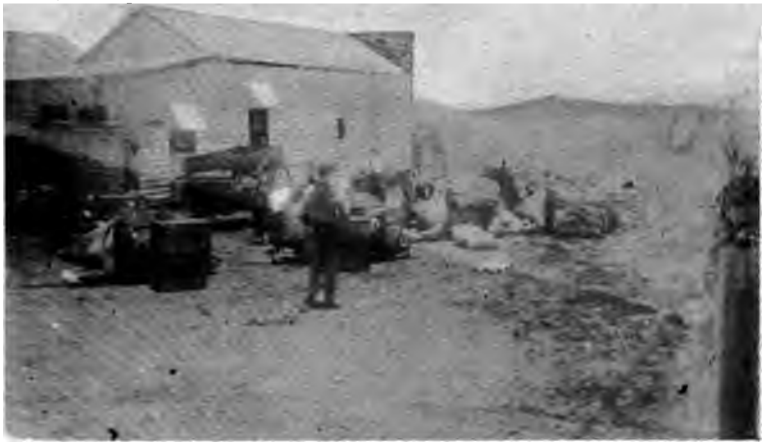
[*Photo., L.C.B.*

FIG. 3.—HORSE-TEAM DRAWING ORE OVER THE DOWNS BETWEEN

was offered unsuccessfully to teamsters for the Normanton route, then liable to flooding, and besides in a poor state for horse-feed, though there was abundant camel-feed (giddia, salt-bush, emu-apple, needle-bush, blue-bush, and dry roley-poley).

The miners look upon the camels as a boon, in that their competition has kept the demands of teamsters within reasonable limits.

Towards the end of 1906 camel teams were carrying ore from Cloncurry to Richmond for £5 per ton, with coke back-loading for £4, while teamsters charged £6 per ton forward and £5 10s. per ton back. Camels carry 12 or 14 cwt., and travel at an average rate of 2 miles an hour, 30 in a string.



[*Photo.*, *L.C.B.*

FIG. 4.—THE ARRIVAL OF PROVISIONS AT CLONCURRY FROM THE COAST.

It is understood that, in the latter part of 1907, a contract was let by Mr. Henry for the conveyance by camel of 1,000 tons of ore from Mount Oxide to Burketown, at £10 per ton.

The miners on St. Paul's Creek and the Leichhardt generally were experiencing difficulty in getting their ore to the seaboard. The reported appearance of poison-bush towards Normanton has deterred the camel-drivers, and the prospect of floods during the coming rainy season has compelled teamsters to refuse £7 and £8 per ton, the distance to Normanton by road being 170 to 180 miles.

Companies.

The information given below, concerning companies operating in the district at the beginning of 1907, has been compiled from various sources.

Celestial Copper and Option Company, Ltd.
Cap.—£5,000. £10 shares.
Prop.—Celestial, Speculation, and Horseshoe.

Cloncurry Copper and Gold Exploration Company, Ltd. (Mgr.: Hockings.)
Cap.—£50,000. 5s. shares.

Cloncurry Exploration Syndicate, Ltd.
Cap.—£7,000. £1 shares. (Floated January, 1907.)

Cloncurry Railway Company.
Prop.—Regina, &c.

Cloncurry Syndicate, Ltd.
Cap.—£50,000. £1 shares. (Floated June, 1906.)
Prop.—Formerly held Ralston leases.

Daisy United Copper Mines Company, No Liability.
Cap.—£30,000. 5s. shares. (Floated January, 1907.)
Prop.—Daisy United, &c.

Federal Reward Copper Company, Ltd.
Cap.—£25,000. 10s. shares.
Prop.—Federal R. C., Mackinlay, Kingfisher, Weatherl, Lady Norma, Elder Bornite.

Hampden-Cloncurry Copper Mines, Ltd. (Gen. Mgr.: C. L. Smith.)
Cap.—£300,000. £1 shares. (Floated March, 1906, and capital increased March, 1907.)
Prop.—Hampden-Duchess Copper Mines, and Tip Top Gold Mines.

Hampden Copper Mines, No Liability. (Gen. Mgr.: C. L. Smith.)
Formerly held Hampden and Duchess Mines.

Lady Fanny. (Option syndicate.)
Cap.—
Prop.—(Lady Fanny Mine).

Mount Merlin Copper Company.
Prop.—Mount Devoncourt and Horse Creek.

New Cloncurry Copper and Smelting Company, Ltd.
Cap.—£3,300. 6s. shares. (Floated October, 1895.)
Prop.—Interest in North Queensland Railway Company, Ltd., and in Queensland Exploration Company.

North Queensland Exploration Company. (Mgr.: Thompson.)
Cap.—£5,000. 10s. shares.
Prop.—Mount Lloyd, Ready Rhino, Junction, Forget-Me-Not.

North Queensland Railway Company, Ltd.

Queensland Copper Freeholds, Ltd.
Cap.—£300,000. £1 shares. (Floated January, 1907.)
Prop.—Malbon, Argylla, Rainbow, Chinaman, Diagonal, Yamamilla, Crusader, and Dobbyn. One-third interest in Mountain Home Copper Company.

Queensland Exploration Company, Ltd. (Mgr.: G. E. Moore.)
Cap.—£200,000. £1 shares. (Floated January, 1906.)
Prop.—Freeholds adjoining Cloncurry and Lady leases.

Wee MacGregor Cloncurry Copper Mines, Ltd.
Cap.—£300,000. 10s. shares.
Prop.—Wee MacGregor, Walleroo, Wattle, Central, &c.

West Cloncurry Copper, Ltd. (Mgr.: Hogarth.)
Cap.—£32,000. 10s. shares.
Prop.—Argylla West (Springs Peaks, Snowstorm, Fuschia, Feathertop, Mount McCabe), Blocks 15, South, and 9, and Central Hampden

Willcocks Cloncurry Development Syndicate. (Mgr.: Matheson.)
Cap.—£112,000. £1 shares.
Prop.—Timberoo, Cornet, Hilda, Comet, Woomera, Belfast, Tharsis, Noontide, Alabama, Pioneer, Huggin's Look-out-and-in. Eva, Jessie, Melba, Secret, Rosebud, Rosewood, Inquiry.

Treatment.

With the exception of the short life (1884 to 1889) of the first Great Australia furnaces, no attempt had been made to treat the ores of Cloncurry locally until 1907. Early in that year an attempt was made to treat the ores in a reverberatory furnace at Slaty Creek, but after a very short run it closed down, Mr. Mort, the metallurgist, informed me, because of insufficient stocks of ore. Later, the Queensland Exploration Company commenced smelting with two blast furnaces, and before the end of the year put through 597 tons. The Willcocks Cloncurry Development Company has completed a blast furnace of an estimated capacity of 90 tons a day, but this has not yet been blown in. The Mount Elliott Company is understood to also be contemplating the installation of a smelting plant at their mine.

Local smelting is handicapped in the first place by the great scarcity of fuel, coke having now to be brought from the seaboard, though the first small smelters managed to carry on with charcoal made from the scanty timber of the neighbourhood. A reverberatory was erected at Slaty Creek, on the assumption that it could be more cheaply worked depending on local timber than a modern blast furnace depending on coke. The scarcity of water during the greater part of the year is also against successful treatment on the spot, but this could probably be overcome by the construction of storage reservoirs.

GEOLOGY.

General.

The rocks in which the copper has been found have been referred to as "the older metamorphic series . . . . . mapped as of Silurian Age, and consisting mainly of steeply inclined—as a rule almost vertical—beds of altered sedimentary strata, being made up chiefly of quartzites, greywackes, slates, schists, and crystalline limestones."*

The evidence† for referring the beds to the Silurian system consists in the identification, by R. Etheridge, junr., of certain fossils from the Cairns Range, at the head of the Georgina River, including (1) *orthoceratites*, sp. ind., (2) *actinoceras* (beaded siphuncle of) sp. ind., and (3) univalve and bivalve (casts and impressions).

Mr. Cameron noticed that west of the West Leichhardt Telegraph Station, and also west from Fiery Creek, the beds are less metamorphosed, while the lead veins of Mended Hill occur in evenly and closely bedded alternating sandstones and shales, showing little metamorphism, and dipping at comparatively low angles at the west. Dr. Jack has lately told me that he has been able to trace a gradual change from copper-bearing schists in the Cloncurry District to lead-bearing shales in the Lawn Hill. I myself noticed that metamorphism is less intense in Gunpowder Creek catchment. Metamorphism has been so intense and the study of the district so hurried and superficial that it cannot be aserted with any authority that the strata of this vast district are of one age, and the occurrence of Silurian fossils in the Cairns Range is insufficient evidence for the classifying of the whole district as Silurian.

they must be newer, but during my examination no case of unconformability was found, omitting, of course, Rolling Downs limestone and Desert Sandstone, both of Cretaceous age, flat-bedded, and nowhere cupriferous. Mr. Rutherford states that the "sandstones" are usually vertical, or nearly so, and it is difficult to comprehend how they could then be unconformable to the underlying (?) or nearly vertical schists. As a matter of fact, both quartzite and limestone are interbedded with the schists, as careful examination of almost any of the crops and workings will show.

In concluding his report, Mr. Rutherford refers again to the distribution of the ores:

> As an impregnation (usually in the form of green carbonate) of the metamorphosed sandstone which occurs almost all over the field, forming the hills and ranges. I consider that the copper was laid down from solution about the same time as the sandstone, and that, since this strata has been metamorphosed and tilted up, the copper has been leached out by percolating water, and has re-deposited along lines of stratification of the rock, usually near beds of quartzite, percolation being easiest between the bedding of this and the adjoining sandstone.

The idea of contemporaneous deposition of copper and sediment was first proposed for the Kupperschiefer (copper shales) of Mansfeld, Saxony, where the ore occurs in thin leaves lying between laminæ of slate. It has now been proved that the shales, sandstones, and limestones have been rendered cupriferous owing to extensive faulting long subsequently to their deposition (as shown by Prof. Franz Posepny). The precipitation of copper with sand is most improbable, but, even if the sandstone had been rendered cupriferous in any way, and indurated, as Mr. Rutherford says, it would then be almost an impossibility to leach it out.

I have been unable to find any justification for Mr. Rutherford's conclusions. The quartzites are of several types, but all are interbedded with the schists. Some of them undoubtedly represent altered beds of sandstone, but the majority of them are segregation deposits formed during the metamorphism of the country, especially along crush-zones. In any case they mark lines of weakness, which have been taken advantage of by copper-bearing solution, and their present cupriferous character is due to permeation by those solutions.

Slates.

Massive and thick-bedded but not fissile slates were noted in several parts, but they are all highly altered, except in the vicinity of Mount Oxide, where they are thin bedded and only slightly indurated. They are, like the schists, steeply tilted, and they strike between north-east and north-west, generally within 20° of north. About Fisher's Creek and the 18-Mile Hotel metamorphism has been less intense than in any other part of the Cloncurry district, and stratification can with little difficulty be distinguished, with the fossiliferous nature of the interbedded limestones.

Limestones.

Limestones, typically lenticular and interbedded with slates or schists, occur at the Duchess and Ivanhoe, Pilgrim, Dandy, Slaty Creek, Mount Wheeler, Pumpkin Gully, Township, Dugald River, Prospector Creek, Mount Bornite, &c.

At Pumpkin Gully the rock shows indistinct traces of a lamellar *Stromatopora*, and on Prospector Creek it is thin-bedded and almost certainly of sedimentary origin. At the other places, however, the rock is highly altered, and in some cases the calcium carbonate may have been leached from the sheared rocks and precipitated chemically in the more open zones. In many places—as, for example, Mount Wheeler and Duck Creek—it is of a very ferruginous character, and at Mount Bornite really approaches ankerite in composition.

The limestones are often accompanied by copper ores, more especially cuprite and native copper, the latter being scarcely ever found except in the vicinity of outcrops of that rock. In these cases the limestone has generally suffered replacement by silica to a greater or less extent, the product being a yellow jasper or impure chalcedony.

Schists.

These rocks show little variety in their macroscopic characters, and in the field most of them are referred to as chloritic or sericitic schist. They are the most noticeable of all the rocks of the district, for the reason that they have been most generally produced in the vicinity of the ore-bearing shear-zones, owing to the movements that have there taken place.

The lamination of the schists in most cases would appear, though not without some doubt, to approximately agree with the original stratification of the country, the chief exceptions being on Duck in length; most of them are twinned in cruciform and stellate forms, showing basal plane and brachypinacoid combined with the simple prism. Interspersed with the staurolite crystals are brown and pink dodecahedra of garnet, about $\frac{1}{20}$ in. in diameter.

The schists mark the site of a worn-down mountain region, or one from which an amount of material equivalent to a mountain mass has been removed. The granites are not found in the Cretaceous areas, and their intrusion must, therefore, have occurred previously to the opening of the Cretaceous period. The occurrence of extensive areas of granite is, however, proof of the removal by denudation of great thicknesses of formerly overlying rock.

The schists in north-western Queensland alone cover an area extending 400 miles from north to south, and 100 (50 to 200) miles from east to west, while the Cretaceous beds which continue southwards into New South Wales, occur over a width of 300 (from 200 to 400 miles). Assuming that one-half the Cretaceous sediments (*i.e.*, over a zone 150 miles wide) were derived from the old north and south range, and that the average thickness of the sediments is 1,500 ft., it may be calculated that the schist range must have had an average elevation of 3,600 ft. The removal of this mass must have caused a rise of the isogeotherms, but the release of pressure being so gradual, the only eruptive manifestations were the giving off of residual gases and solutions, from which were formed the pegmatites, and possibly in part the ore-bodies.

The Coppermine-St. Paul's Creeks, Donaldson, and Duck Creeks belts are similar, though the country of the first is less schistose, and is characterised by the great development of a brown porphyry. This is sometimes schistose, and at others much altered, when it much resembles greywacke. The occurrence of blows of quartz and the distribution of bunches of ore in schist is the same, but the ore-bodies are more ferruginous on the northern belt, and there is some likelihood of the ore-bodies being more permanent, while the shoots of ore are longer, though not so rich. In these belts schistosity has been produced, chiefly along crush- or shear-zones.

In some parts—*e.g.*, west of Prospector Creek and south of Six-mile Creek (Leichhardt River)—wide areas have been rendered uniformly schistose, and ore-deposits are there conspicuously wanting, presumably owing to the absence of well-marked fracture-zones.

Gneissoids.

Between the Lady Fanny and Mount Hope Groups a series of dark-coloured gneissic rocks, in which the separation of the felspar, quartz, and ferro-magnesian minerals into bands has taken place, was noticed. The Little Beauty ore deposits occur in this rock, a product of dynamic metamorphism.

Quartzites.

Blows of granular quartz, often referred to as quartzite, are among the most prominent features of the schist areas. This quartz may have segregated from the country rock during the metamorphism, or may have been introduced from deeper-seated regions subsequently to the metamorphism, or the quartz bodies may have been produced in both ways in different parts. The quartz in the crush-zones of Duck Creek may be taken as due to segregation, while the "blows" of Mount Hope may be considered as due to intrusive after effects. As has elsewhere been stated, the pegmatite dykes of Mount Hope are evidence of pneumatolysis having been effective in that locality.

Granite.

The granite areas in the district covered are five in number—all, except the northernmost, which is granite—porphyry, typical quartz-orthoclase-biotite rock.

There is one on the divide between the Florence River and the Cloncurry River to the south; another stretches from Table Mountain to beyond the Mavis Mine; a third (inadvertently omitted from the plan accompanying this report), lies between the heads of Prospector Creek and the Dugald River; the fourth lies to the west of the upper part of St. Paul's Creek; and the fifth extends southwards from the lower part of Gunpowder Creek, across Mistake Creek, almost to Surprise Creek.

No attempt was made to map-in the boundaries of these areas, but all of them except one were traversed in travelling between the mines. There appears to be no doubt, however, as to their having of quartz, but the basal part is a brownish micaceous quartzite, irregularly veined in all directions by pegmatite. These veins often have a comb-in-comb structure, owing to abundant schorl having crystallised at right angles to the containing walls. Many of the dykes are only faintly demarked from the quartzites, and crystals of felspar were noticed in the latter several inches from the dyke.

Tourmalinisation, due to deep-seated intrusions of igneous magmas, is not wanting on Slaty Creek and towards the head of Duck Creek, as well as surrounding the granitic area, which stretches from Cloncurry to the Dugald River. Pegmatitic veins are especially abundant in the flanks of Table Mountain.

While it is likely that most of the quartz of the crush-zones segregated from the country rock during its metamorphism, the probability of some of the silica having been given off pneumatolytically from the granitic magma is not to be overlooked.

Porphyry.

Porphyry, more or less schistose and altered, occurs in quantity in many parts of the district, and abundantly in the vicinity of the Lady Fanny, Monitor, Just-in-Time, Mount Cuthbert, Crusader, Dobbyn, Bull Creek, and Eclipse groups. These were mistaken in the field for highly altered sedimentaries, being mostly somewhat schistose, while the phenocrysts, as a rule, are not sharply defined macroscopically from the ground mass. Microscopic examination, however, proves their igneous nature—at least in the case of rocks from the Dobbyn and Bull Creek groups, which were the only ones of which sections could be obtained. From the occurrence of the rock it is likely that it is an extrusive, and that it is interbedded with the sedimentaries in which it is found.

The occurrence of copper ores in the rock in the Lady Fanny group, the locus of its greatest development, is of much interest, because of immense low-grade impregnations of porphry in the United States, where, however, there is an important difference, in that the rocks have suffered decomposition allowing of the downward leaching of the copper.

Dyke Rocks.

Diorite was recognised in several places—Hampden, Duck Creek, Slaty Creek, Argylla, St. Paul's, Copper-mine Creek, and Bull Creek. The occurrences seemed generally to be in the form of bosses, but in no case was there an opportunity to define its extent.

Besides the easily detected crystalline, scarcely altered rock referred to above, there is in almost every part of the field a great abundance of a dark, greenish, fine-grained rock, exhibiting every sign of extreme metamorphism. This was mistaken by me in the field for an altered sedimentary, but sections of the rock from the vicinity of the

Great Australia and the Argylla, lent me by Mr. Hartwell Conder, of Melbourne, prove conclusively that they are diorite and amphibolites. As they are highly altered, exhibiting all stages down to a hornblende schist, their intrusion must have occurred prior to the metamorphism of the country, but the crystalline rocks first referred to may be of later date.

Southwards on Duck Creek and the Malbon there is little evidence of late igneous intrusion, the diorites there being older than the metamorphism, crushing, and mineralisation (chiefly silicification) of the country.

In considering the genesis of the copper ores, the most likely suggestion is that the copper has been derived from these igneous rocks subsequently to their metamorphism, and has been concentrated along the crush-shear, and fissure-zones where conditions were favourable for depositions.

Besides the diorite, aplite and pegmatite were found in many parts—at the head of Duck Creek, at Mount Hope, at Table Mountain, at Quamby, on the Dugald River, and north-west of Donaldson. These are of much interest as bearing out the statement that certain quartz veins pass gradually into pegmatite. My time was not sufficient to allow of the tracing out of the change in any particular case, but on the various parts of the field were noticed practically all gradations between a normal pegmatite and a quartz vein with a few scattered crystals of orthoclase, while, of course, "blows" of pure quartz are very common. The lenticular nature of the veins in this district would probably prevent any very much more definite assertion than the above, even had much time been spent on the study.

Petrology.

The slices, briefly described below, were lent me by Mr. Hartwell Conder, of Melbourne. They clearly indicate that many of the dark-coloured rocks seen are of igneous origin, though it would undoubtedly require much time and labour to delineate the line separating them from the old sediments. The schists also are in many cases amphibolites, probably produced under shearing stresses by the rearrangement of the minerals constituting original diorites.

4. Quartzite, Mt. Norma. A very fine-grained mosaic—chiefly quartz, with only occasional rounded grains of trichlinic felspar and flakes of a brown chloritic mineral. The quartz grains are irregularly shaped and ill defined, and generally, if not always, free from inclusions. Some small grains of zircon were noticed. The rock is apparently of secondary origin.

6. Quartzose rock, Argylla ("Quartz Porphyry"). Felspathic base with slightly schistose structure—pheno-crysts of quartz and felspar—and small fragments of same thoroughout the base, which consists of about equal proportions of granular secondary quartz and feathery laths of kaolinite or cordierite.

7. Granite, Argylla Road. Orthoclase, plagioclase, quartz and biotite. Typical intrusive, granular, crystalline rock.

1. Mica Schist, Mt. Norma. Granular quartz with flakes of biotite. A few needles of sillimanite (?).

8. "Hornstone" (Chalcedonic vein quartz), Great Australia. Chalcedony-spherulitic and stained yellow. Quartz in kidney-shaped, bell-shaped, and generally rounded spots. Also dark-brown opaque areas of limonite.

A secondary rock accompanying most of the ore deposits, and variously referred to in this report as silicified limonite, ferruginous chalcedony and yellow jasperoid.

2. Amphibolite. Aligned acicular hornblende, some prismatic sections showing cleavage, in a base consisting chiefly of secondary silica, though there are patches that may have been felspar. The minerals are of secondary origin.

5. Diorite, Argylla. Microcrystalline hornblende, some twinned kaolinised felspar, magnetite in skeleton forms, and a very little free quartz.

11. Quartzite, Cloncurry. Granular quartz and plagioclase, cemented by secondary silica, the felspar being more especially in nests.

12. Schist, Great Australia. Flakes of chlorite and also of hornblende (some showing prism cleavage), with magnetite and kaolinite (?) base.

10. Schist, Great Australia. Crushed hornblende, kaolinised felspar, coarse-grains quartz, and magnetite in altered hornblende.

Register of Minerals,

With composition and associations noted in the description of the mines (Part 2).

Actinolite (Magnesium-calcium iron silicate).—Monoclinic, greenish needles.
Daisy United: Associated with calcite and epidote in metamorphosed eruptive (?). Melba: In siliceous formation. Wanderer: In metamorphosed sediments.

Ankerite (Calcium-magnesium-iron carbonate). Rhombohedral. Buff.
Mount Bornite: Lenticular beds.

Atacamite (Copper oxy-chloride).—Copper = 63%. Rhombic. Emerald green.
Mounts Elliott, Wheeler, and Weka: Minute crystals in gossan. Mount Oxide: In crystalline form with malachite.

Azurite (Hydrous copper carbonate).—Copper = 55·5%. Monoclinic. Blue.
Balfour, Boomerang, Caine's King, Cleopatra, Easter Gift, Erin-go-bragh, Eva, Ma Foi, Magnet, Mavis, Monitor, Pioneer, Pumpkin Gully, and Thistle: As stains. Mighty Atom, Morning Star, and Wallaroo: Impregnations. Celestial and Federal: In crystalline form.

Biotite (Magnesium-potassium-iron-aluminium silicate).—Monoclinic. Black.
Mavis: Flakes with chlorite, felspar, quartz, and ilmenite.

Bismutite (Bismuth carbonate).—Greenish.
McEvoy's: Lumps with chalcopyrite, malachite, quartz, and tourmaline.

Bismuth (native and carbonate) occurs with gold at Top Camp,* and the Warden, in March, 1904, reported it to occur in flakes and patches through copper formation in Willmett's claim, Duck Creek, from which 2 cwt. was shipped.

Black Oxide (Cupric oxide).—*See* Melaconite and Tenorite.
Hampden and Mount Cathbert: probably really sulphide.

Bornite (Copper-iron sulphide).—Copper 50 - 70%. Cubic. Brown. Metallic.
Mavis, M.F. 19, Pumpkin Gully, and Timberoo: Probably enriched chalcopyrite. White Rose: Irregular bunches and veins in quartz and calcite.

Calcite (Calcium carbonate).– Rhombohedral. Colourless. Vitreous.

Chlorite (Hydrous magnesium-aluminium-iron silicate).—Monoclinic. Dark-green.

Caine's King and Cleopatra: Lines and flakes in quartz. Eva Extended: In quartzite. Hampden Block 25: Flakes in calcite. Highland Mary: Lenses in altered eruptive. Mavis: In felspar rock. Mount Wheeler: Crystals in calcite and pyrite.

Chrysocolla (Hydrous copper silicate).—Copper = 36%. Amorphous. Blue or green.

Chrysocolla is almost as abundant as malachite, but the best specimens were obtained from the Highland Mary and Springs Peaks, though it is very abundant at Mount Wheeler.

Covellite (Cupric sulphide).—Copper = 66%. Blue-black.

Ardath: In small quantities; doubtful.

Cuprite (Cuprous oxide).—Copper = 89%. Cubic. Red, glassy, or earthy.

Cuprite is found in most parts of the field; at Mount Elliott in minute veinlets in the gossan, but elsewhere, particularly at the Hampden and Great Australia, as nodules, often enclosing a nucleus of copper.

Cyanochalcite (Hydrous copper silicate).—Copper = 36%.

Dandy: With malachite, chalcocite, cuprite, and chalcedonic silica.

Dioptase (Hydrous copper silicate).—Copper = 40%. Hexagonal. Emerald-green.

Banjo and Weka: Doubtful, with chrysocolla. Belfast: Doubtful, with calcite. Mount Elliott: Stains. Mount Wheeler: With chrysocolla, atacamite, and malachite in limonite. Trump: With glance, malachite, chrysocolla, and pyrite.

Dolomite (Calcium-magnesium carbonate). Rhombohedral. White.

Mount Wheeler: Reported by Mr. Waller. Atlanta: In crush-zone.

Enriched Chalcopyrite.—This is chalcopyrite from which some of the iron sulphide has been removed, so that the mineral now appears to be veined with chalcocite. The process has sometimes been carried on so far that only specks of the chalcopyrite can be distinguished in massive chalcocite, but more often it forms a mosaic referred to below as tesselated ore. Enriched chalcopyrite occurs at most of the mines, but especially good examples were seen at the Pioneer Chief.

Epidote (Hydrous aluminium-calcium-iron silicate).—Monoclinic. Yellow to green.

Daisy United: Needles with actinolite and calcite in diorite (?). Highland Mary: Amygdules coated by chalcedony in eruptive (?). Hilda: In eruptive (?). Springs Peaks: Granules with felspar, hypersthene, quartz, and hæmatite.

Epsomite (Hydrous magnesium sulphate).—Fibrous. White.

Duchess: Efflorescent on roof of old drive.

Erubescite (*See* Bornite).

Centipede: Splashes with chalcopyrite in limestone.

Felspar (Alumium-sodium-potassium-magnesium-calcium silicate).—Monoclinic. Grey.

Springs Peaks: Crystallised in association with hypersthene, quartz, epidote, and hæmatite.

Ferro-calcite (Calcium-iron carbonate).—Rhombohedral. Brownish.

Dandy: With cuprite and limonite. Glenferrie: With chalcopyrite, glance, and limonite. Gorge Hotel: With quartz and ilmenite. Ida: With chalcopyrite. Marguerite: With quartz and pierced by tourmaline. Policeman: With hæmatite and chrysocolla.

Glance (Cuprous sulphide).—*See* Chalcocite.

Gold.—Alice and Daisy United: In quartz. Mighty Atom: Residual in gullies. Flying Dutchman: Reported. Hampden: In copper ore. Lady Fanny, McPhail, and Mount Elliott: In gossan. Last Call: Reported. Unnamed north of Lady Fanny: As paint on hæmatite.

Gothite (Hydrous ferric oxide).—Earthy. Yellow.
Brilliant: In gossan. **Mountain Maid**: Earthy. **Mount Wheeler**: Pseudomorph after pyrite.

Grey Copper Ore (copper sulph-antimonide).—Copper = 38.6%. Cubic. Grey, metallic.
Rainbow: Reported by Dr. Jack.

Grey Ore (Copper sulph-antimonide).—Copper = 38·6%.
Argylla and **Pumpkin Gully**: Reported by Mr. Jack.

Gypsum (Hydrous calcium sulphate).—Monoclinic. Colourless, vitreous.
Mount Wheeler: With calcite and pyrite.

Hæmatite (Ferric oxide).—Rhombohedral. Red to black, metallic.
Belfast: Rosettes and sheets on cleavages planes of calcite. **Crusader**: With magnetite and malachite in sericite. **Dandy**: With copper ore in limestone. **Easter Gift**: Granular. **Great Australia**: Pisa Hill and small crops north of the main workings. **Gorge**: Flaky. **Jessie** and **Mount McCabe**: Reported. **Mount Sylvia**: Granular. **M.F. 3**: Crops. **Policeman**: With ferro-calcite. **Springs Peaks**: Grains with felspar, hypersthene, and epidote. **Thistle**: Schistose, micaceous, and granular crop. **Timberoo**: Massive. **Un-named north of Lady Fanny**: Crystalline.

Hornblende (Iron-magnesium-aluminium-calcium-manganese silicate).—Monoclinic. Greenish.
Lady Fanny: With chalcopyrite in schist.

Hyalite (Silica).—Amorphous, mammilated. Colourless.
Mount Wheeler: Thin films coating chrysocolla and cavities in limonite.

Hydromica (Hydrous aluminium-magnesium silicate).
Timberoo and **Mount Minde**: Crystalline aggregates in gossan.

Hypersthene (Magnesium-iron silicate).—Rhombic. Greenish-brown, pearly.
Springs Peaks: With felspar, quartz, epidote, and hæmatite.

Ilmenite (Iron titanate).—Rhombohedral. Black, submetallic.
Gorge Hotel: With ferro-calcite and quartz. **Mavis**: Orthoclase, quartz, and biotite.

Malachite (Hydrous copper carbonate).—Copper = 57·5%. Monoclinic. Fibrous, green.

Alice: Radiating 3-in. spheres encrusted by chalcedony or chrysocolla. Banjo: Replaced by chrysocolla. Chum: Acicular, with crystalline cuprite, chalcocite, or limonite. Crusader: Radiating spheres in plumose sericite. Cummin's: Radiating spheres coated with secondary silica. Lady Clayre: Radiating spheres. Tambourine: Radiating nodules with chalcedony on joints.

Manganese dioxide.—Fibrous. Black.

Hilda: gossan. Mount Cuthbert No. 1 North: Stains in quartz breccia (cemented by limonite). Slaty Creek (1 mile south of Gorge Hotel: In slate.

Melaconite (Cupric oxide).—Copper = 80%. Powder. Black.

Mount Metallic: In cellular limonite with malachite.

Molybdenite (Molybdenum sulphide).—Foliated. Grey, metallic.

May Graham: In chalcopyrite-chalcocite ore.

Native Copper.—Octahedral. Reddish.

Banjo: In tile-ore. Blue Jacket: With malachite, cuprite, and chalcocite in limonite. Boundary: In cuprite. Crusader: With glance. Dandy: With cuprite in calcite. Great Australia: With cuprite in formation. Jessie's Dream, May Graham, M.F. 14, Mount Cuthbert, and Oliver Twist: With cuprite. Little Wonder: Surrounded by concentric cuprite. Mount Metallic: Crystalline in cuprite.

Oxychloride.—See Atacamite.

Mount Oxide: Bunch in schist.

Porcellanite.

Highland Mary: With chrysocolla and malachite.

Pyrite (Iron sulphide).—Cubic. Silvery, metallic.

Pyrite was noted in a great number of localities, the largest block seen being at the Hampden. Much of it is thought to be leached chalcopyrite.

Quartz (Silica).—Hexagonal. Colourless, glassy.

Quartz has been concentrated in various forms and in great quantities in every part of the field. The quartz "blows," rising like ruined walls, mark lines of crush-zones. In these the quartz which at least in part replaces schist, is generally granular, but the crystals were sometimes seen, and "dog-tooth" structure is not uncommon. Quartz has also indurated porous strata of some thickness over great distances.

Red Oxide.—See Cuprite.

Argylla: Reported by Mr. Jack. Mount Leslie: Reported by Mr. Rutherford.

Ruby Ore.—See Cuprite.

Pooncairie: Reported.

Scheelite (Calcium tungstate).—Tetragonal. Yellowish.

Shamrock: Reported. Slaty Creek: The Warden, in October, 1904, reported that scheelite had been found in small quantity on Slaty Creek. West Hampden: Scheelite has been twice reported from West Hampden. Colton and Woodhouse, in May, 1905, reported that the following assays of ore from their claims had been made by the Irvinebank Mining Company:—

No. 1 Scheelite.
Cu = 1·68 per cent.
FeO = 3·88 ,,
WO_3 = 70·30 ,,
CaO = 15·70 ,,
91·56 per cent.

No. 2 Scheelite and Wolfram.
Cu = 2·60 per cent.
FeO = 9·02 ,,
WO_3 = 70·30 ,,
CaO = 12·00 ,,
93 92 per cent.

Woodhouse and Tait, in May, 1906, shipped 5 cwt. of scheelite, assaying 75% tungstic acid.

Schorl.—See Tourmaline.
Shamrock: With quartz, calcite, and chalcopyrite. Tambourine: Needles in quartz.

Secondary Silica.
Cummins': Coating malachite. Great Australia: Ferruginous. Mount Cuthbert No. 1 North: Cavities in limonite Mount Wheeler: Coats on limonite. Pooncairie: Reported. Tambourine: With chrysocolla. Yamamilla: Reported to cement quartz.

Secondary Sulphide.—Probably earthy chalcocite, often mistaken for Black Oxide.
Isabella No. 4 North: With chalcopyrite. Italian: In softened schist. Mount Cuthbert: Leaders. Mount Elliott: In gossan and kaolinised slate on 125-ft. level. Pearl: Coating glance. Ruth: In cellular gossan. Springs Peaks: Films in chalcopyrite. Una: With malachite.

Selenite (Hydrous calcium sulphate).—Monoclinic. Colourless.
Mount Wheeler: With quartz, calcite, and pyrite.

Sericite (Aluminium-hydrogen-potassium silicate).—Scaly muscovite.
Crusader: Plates and plumose aggregates in schist. Further, most of the crushed rocks of Cloncurry may at least provisionally be classed as sericite schists.

Serpentine (Hydrous magnesium silicate).—Amorphous. Greenish.
Springs Peaks: Alteration product of hypersthene.

Siderite (Iron carbonate).—Hexagonal. Buff coloured.
Noontide: With chalcocite and malachite in formation, altering into turgite. Pumpkin Gully: With quartz.

Silicified limonite.—See Jasperoid and Chalcedony, of which this appears to be a ferruginous form.
Argylla: Passing into quartzite. Brilliant, Noontide, Pioneer Chief, and Policeman: In crush-zones Dandy, Dreadnought, Fairfield, Ivanhoe, and Trump: Replacing limestone. Great Australia: Crush-zones.

Sinter (Calcium-magnesium carbonate). Amorphous.
Advance: Produced from weathering of hornblende rock. Atlanta: In formation Blue Bell: In ore. Daisy United: In ore and country. Excelsior: Earthy white with jasper in limestone. Hare's Excelsior: In formation. Little Wonder No. 1 North: Floors in ore. Queen Bee:

Turgite (Hydrous ferric oxide).—Reddish.
Highland Mary and Noontide: Earthy, in ore. Mount Wheeler: Earthy. Trump: With jasperoid on crush-zone.

Tesselated ore. See Enriched Chalcopyrite.—Chalcopyrite, altering into chalcocite and limonite.
Ardath, Easter Gift, Highland Mary, Hilda, Little Beauty: With malachite. Mascotte: Chiefly limonite. White Rose.

Wolfram (Iron manganese tungstate).—Wolfram has been reported from West Hampden, where it occurs with scheelite. (*See* Scheelite.)

COPPER ORE DEPOSITS.

Nature and Genesis.

It has been remarked by Mr. Cameron that "The copper outcrops and deposits run almost universally with the strike of the country rock, and are distinctly bedded deposits and not fissure lodes,"* but subsequent investigations show the deposits to be on fissure-, shear-, or crush-zones.

With the following statement of Mr. Cameron's I am quite in accord:—

> This leaching out and concentration of the copper above water-line accounts for the presence of the phenomenally rich ores that are found outcropping at the surface all over the Cloncurry District. . . . Below the water-line they will no doubt be replaced by the ordinary low-grade sulphide ore, which has been met with in one shaft in the Hampden mine. . . . . . . The various surface deposits are generally too irregular, both in quality from point to point and in extent, to allow of more than rough guesses at their value being made.

Full descriptions are given in Part II. of this report of most of the exposures accessible at the beginning of the year 1907, but no attempt has been made to estimate quantities of ore available on the various lines between disconnected workings, for the reasons already given.

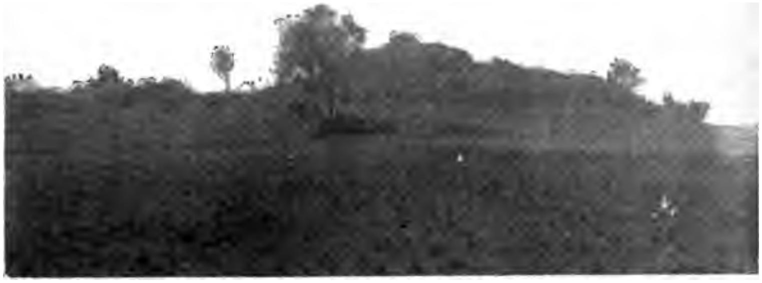


FIG. 5.—MAIN CROP, GREAT AUSTRALIA, LOOKING SOUTH.

Mr. Rutherford, in his "Conclusion," states that the ore (on the Cloncurry field) occurs in two ways:—

> (1) As an impregnation (usually in the form of green carbonate) of the metamorphosed sandstone which occurs almost all over the field forming the hills and ranges.

---

* Op. cit. (Rec. developments in the Clon. Copper Mining District).

> (2) As small lenticular deposits of rich ore deposited in foldings or along bedding planes of schists and shales. These usually occur in flat country where the overlying sandstone has been almost entirely removed by denudation.
>
> In the case of the first mode of occurrence what are known as "reefs," "dykes," and "outcrops" in the district are simply beds of quartzite interbedded with the sandstone from which they were formed.

It has already been shown that the copper is more likely to have been derived from basic igneous rocks than from white quartzites, and it has also been pointed out that the quartz "blows" or "reefs" are interlaminated with the schists, and do not unconformably overlie these rocks.

While at work in the field it was thought that the Cloncurry iron ores were of pneumato-hydatogenetic origin—*i.e.*, had been given off in residual gases from cooling acidic magmas, but a study of the recent literature of the subject has convinced me that both iron and copper ores are due primarily to regional metamorphism, perhaps enriched in parts by ascending metalliferous solutions.

REGIONAL METAMORPHISM.

It has been pointed out by Lindgren* that—

> There are certain deposits which owe their origin to dynamo-metamorphic or regional metamorphic processes. . . . . . . Characteristic for the regional metamorphic deposits are (1) the association of oxides of iron with sulphides so utterly foreign to the deposits formed by ascending waters, and (2) the minerals (garnet, amphibole, epidote, &c.), which distinguish the contact deposits. Bornite, so common in the latter, does not, however, seem to occur in regional metamorphic deposits. In regional metamorphism there has been but little transportation of substance; the masses of ore are rather old disseminations or originally sedimentary deposits concentrated and rearranged under the influence of heat and permeating moisture.

The Cloncurry district meets the above in every particular, even

Magnetite is found as well as chalcopyrite in ore deposits formed under conditions of stress.

The Cloncurry deposits may possibly be due, at least in part, to the metamorphism of originally cupriferous igneous rocks, as described under the second paragraph. The cupriferous schists of Hampden (and the Lady Fanny) may well have had such an origin, undoubted igneous rocks occurring at both places.

SECONDARY ENRICHMENT.

In arriving at the genesis of the richer deposits, it must be remembered that they almost all occur in the flat bottoms of the valleys, the chief exceptions being on the Corella River and Argylla Creek, and at Mount Oxide. There is evidence in the equi-altitudinal ranges and mountains, rising several hunderd feet above the valley bottoms, of a peneplain having existed, prior to the dissection of which mineralisation by *rising* solutions took place, chalcopyrite being precipitated in crush-zones on the schist generally in small quantities. The dissection and degradation of the old peneplain are so far advanced—it being now represented by narrow table-topped ridges and chains of conical hills, palpably the stumps of ranges, themselves the harder ribs of the peneplain—that there are already indications of a future Duck Creek—Chinaman Creek peneplain. The amount of material removed during the erosion of the valleys has been enormous—to be calculated in units of cubic miles—and has gone to build up the Cretaceous strata to the east.

During denudation some of the copper ore would be carried off mechanically by the surface streams, but the greater part of the ore, owing to its relatively high specific gravity, would tend to sink beneath the soil and subsoil, where it would come within the sphere of action of meteoric waters, acid laden from the oxidation of the primary sulphides. When fissure- or crush-zones offered a ready passage the course of these waters would be a descending one, and the copper would be precipitated by the first pyritic ore encountered.

The general occurrence of rich secondary ores at the surface is due to the valley bottoms, which are near the present base level, being near the water level of the old peneplain. The present water level is 20 to 70 ft. below Duck Creek, and the rich ores have not yet had time to migrate downwards. The proportion of original pyrite is low, as proved by the general absence of gossan, and the amount of acid produced by its oxidation is insufficient to make any perceptible effect on the ore bodies. Any copper that does go into solution is almost at once precipitated, changing cupriferous pyrite to chalcopyrite, and chalcopyrite to chalcocite, iron at the same time going into solution.

Most of the quartz is probably of the same age as the cupriferous pyrite, but chalcedonic jasper (often referred to as silicified limonite) is in all cases younger.

The general absence of considerable massive glance in ore-bodies at any elevation above the valleys seems to indicate that secondary enrichment does not there become complete, owing to the rapid downward course of the cupriferous waters.

While the primary circulations causing solution of the copper may in some cases be ascribed to pneumatolytic after-action of a cooling batholith, continued activity of the ore solutions may have been connected with the production of huge monoliths and razor-backs, such as that to the west of the Mount Hope leases (1,000 ft. high, 2 miles wide, and several long). The development of peneplains and wide valleys having left these masses without lateral support, their whole weight thus bears on limited areas of underlying, perhaps relatively shallow, magmas. It is conceivable that under these circumstances rising solutions would be more likely to rise towards the newly formed valleys, the areas of low pressure. Precipitation would follow on reduction of pressure and temperature. This theory is applicable to most of the Cloncurry groups, the mines being generally in the broad valleys.

The wide-spread occurrence of chalcedony in the oxidised ores—*e.g.*, McPhail, Mount Elliott, Mount Walker, &c.—as one of the latest minerals deposited, may be taken as evidence of a deep-seated action, for silica does not readily go into solution at the earth's surface, but is to be easily dissolved at great depths. Silica is precipitated again under considerable pressures as quartz, but near the surface as chalcedony, and the occurrence of which in the gossan is evidence of continuity of action of the uprising solutions.

The finding of nodules of cuprite and native copper near the surface was one of the features of the early days at Cloncurry, and ut few particulars are available as to the nature of the nuggets and eir source is believed to be beneath the glaciers at the head of the ver.

CHEMISTRY OF DEPOSITION.

A brief reference to the chemistry of ore deposition is advisable order to bring out the probable genesis of the deposits.

Secondary chalcopyrite may be produced in two ways—*first*, by idation and leaching of excess iron sulphide from lean pyritic ores—

$$FeS_2 + (CuFeS_2) + 30_2 = CuFeS_2 + FeSO_4 + SO_2.$$

econd, by the action of soluble copper salts on pyrite—

$$2FeS_3 + CuSO_4 + O_4 = CuFeS_2 + FeSO_4 + 2SO_2.$$

Enrichment takes place as follows:—(1) Primary chalcopyrite or upriferous pyrite, in the oxidising zone, breaks up and oxidation roceeds along the cracks formed. Limonite always appears as one of e products, and chalcocite is generally present also, in varying nounts.

The oxidation of chalcopyrite* is expressed as follows:—

$$CuFeS_3 + 80 = CuSO_4 + FeSO_4.$$

hen,

$$FeSO_4 + O = Fe_2(SO_4)_3$$

nd

$$Fe_2(SO_4)_3 + H_2O = \text{basic sulphates} + Fe_2(HO)_3 + H_2SO_4.$$

The production of glance may then take place from the action of e copper sulphate either on pyrite or chalcopyrite:

$$14CuSO_4 + 5FeS_2 + 12H_2O = 7Cu_2S + FeSO_4 + 9H_2SO_4 + 3H_2SO_4.$$

The removal of copper from the zone of weathering depends on e action of ferric sulphate on sulphides:

$$Cu_2 + Fe_2(SO_4)_3 + 20_2 = 2CuSO_4 + 3FeSO_4.$$

is reaction can seldom occur in the Cloncurry district, because of e breaking up of the ferric sulphate with the production of limonite.

Replacement of the limonite by chalcocite appears generally to ve taken place, and sometimes only traces of the former can be tected, though small specks of the original chalcopyrite are abunntly scattered through the chalcocite. The generally adopted equaons are as above.

Amorphous sulphide is produced by the action, on chalcopyrite, ferric sulphate, which removes iron:

$$Cu_2S\,Fe_2S_3 + Fe_2(SO_4)_3 + 60_2 = Cu_2S + 2Fe_2(SO_4)_3.$$

The production of cuprite in the Cloncurry district would seem to cur under special conditions, chief of which is the presence of limestone. The cuprite always occurs in irregular form, surrounded by limonite, which it appears to replace, and in certain cases contains a kernel of native copper. This is the latest product, and has been reduced from the cuprite by its action on solutions produced during the oxidation of chalcopyrite:

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* Prof. paper. 43. U.S. Geol. Sur., p. 183.

$$Cu_2O + H_2SO_4 = Cu + CuSO_4 + H_2O.$$

$$Cu_2S + 3Fe_2(SO_4)_3 + 4H_2O = 2Cu + 6FeSO_4 + 4H_2SO_4.$$

The precipitation of native copper or covellite by the action of copper sulphate on pyrite in the absence of air—*i.e.*, in upper part of ground—the water is shown thus:

$$CuSO_4 + FeS_2 = CuS + FeSO_4.$$

Production of native copper results when copper sulphate acts on chalcopyrite:

$$CuSO_4 + CuFeS_2 = 2Cu + FeSO_4 + S_2.$$

Occurrences Beyond Queensland.

NEW SOUTH WALES.

The Girilambone* lodes are to be compared with certain Cloncurry deposits.

There are two copper-bearing lodes.

The outcrops do not show any genuine gossan, but are ironstained contorted slates, which do not show any copper minerals on the surface, except in one or two places, where the lode material is kaolinised. The main lode does not appear to have any distinct walls.

It strikes approximately east and west, and is cut across by an east and west slide, which throws the lode down to the east. The south lode underlies towards the main, and is expected to junction

WESTERN AUSTRALIA.

The Cloncurry schist has much in common with that covering the greater part of Western Australia.

> Coarse crystalline schists and gneiss, which differ but little from granite and other rocks of like origin, as well as basic rocks, which have been more or less crushed, foliated and completely converted into greenstone schists. . . . . Some of these older rocks are of sedimentary origin, and are practically unaltered; others are quartz, mica-schist, and granulites.*

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*Recent advances in the knowledge of the Geology of Western Australia. By A. Gibb Maitland, F.G.S., Govt. Geologist. G.S.W.A. Bull. No. 26, p. 37.

The laminated quartzites and jaspers, so characteristic of the schist areas of Western Australia, have been proved to "pass by almost insensible gradations into the enclosing basic schists, the whole appearance suggesting a gradual replacement of the original rock along lines of maximum compression." They would, therefore, appear to be genetically related to the siliceous crush-zone formations of Cloncurry, which, however, are associated with copper deposits, where the Western Australia are associated with gold-bearing reefs—*i.e.*, in the more basio schists.

The quartz blows of Cloncurry seem to have their exact counterpart in the Pilbarra "quartz reefs, which stand up to considerable altitudes above the surface like a wall, and which can in some cases be traced across country, with more or less interruption, for miles."* These, it has been suggested, may be genetically connected with pegmatites, as seems probable, in certain cases at least, in North Queensland.

WYOMING.

A description of copper deposits of the Hartville Uplift, Wyoming, has just been published by Mr. Sydney H. Ball.†

Certain of these deposits and those in the Cloncurry districts have much in common, lenticular or globular masses pinching out at slight depths in Pre-Cambrian schists and limestones, and doubtful fissure veins have been indicated. It is held that the more important deposits were deposited by descending waters, seeping from overlying sedimentary deposits. The ores found are the same as those at Cloncurry, with the addition of bornite, and the association of hæmatite and impure flint (heavily iron-stained jasper) in the schists is another point of resemblance. The iron ore in many cases is considered to have been an important precipitant of copper, but it is stated that the copper ores are in no way connected with the igneous rocks.

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* Op. cit. Rec. Adv. Geol. of W.A.

† Contributions to Economic Geology, 1906, U.S. Geological Survey. Bulletin No. 315, p. 93.

CALIFORNIA.

Bully Hill district:

The ore bodies occur very irregularly distributed in shear-zones, and range in size from lenticular or sheet-like nodules less than an inch in diameter to hundreds of feet long, and up to nearly a score of feet in thickness. The crushed rock in the shear-zone is not always mineralised, but generally it is more or less richly impregnated with ores, sometimes to complete replacement.*

Great lenses of pyritic ore occur in a shear-zone traversing meta. rhyolite in Shasta Co., Calif.†

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* Copper deposits of the Redding Region, Calif. By J. A. Diller, U.S. Geol. Sur. Bull. No. 213, p. 126.

† Copper production of the United States. By Walter Harvey Weed. U.S. Geol. Sur. Bull. No. 260, p. 216.

VERMONT.

In the Vermont copper belt the deposits occur along a due north-south line, which corresponds to the general direction of schistosity of the rocks—grey micaceous schists and gneisses, formed from sandstones and shales by regional metamorphism.

Intercalated in the schist are masses of quartz, produced during the sericitisation of the original sediments—silica being freed when ordinary silicates change to sericite.

The ore deposits occur as lenticular masses, conforming to the foliated of the schists.

At each locality but one workable lens has been found outcropping, and in the deep mines the lens wedges out in depth, but is found to overlap the upper-tapered end of another lens in the footwall rock.*

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*Notes on the Copper Mines of Vermont. By W. H. Weed. U.S. Geol. Sur. Bull. No. 225, p. 190.

Mexico.

Impregnated shear-zones are found in Sonora, Mexico*—usually without distinct walls. Ore bodies are impregnations of decaying country rock, irregular in form, and not occupying the whole of the zone.

A saturation of sheared or shattered rock in a zone of fracture and displacement, with metal-bearing solutions, without the normal accompaniment of quartz, calcite, or other vein stone.

A second important type is the barren quartz vein with rich impregnations in the enclosing rock.*

* E. and M. Jour. 6 4 07, p. 657. F. I. H. Merrill.

Rammelsberg.

True vein formed in shear-zone along fault, by which the Rammelsberg rock series was inverted "genetically dependent on an acid eruptive rock." (Vogt.) Lentic masses, 40 to 60 ft. thick and up to 4,000 ft. long. Pyrite with copper-pyrite and fablore.

IRON ORE DEPOSITS.

Town.

Mount Leviathan.

Mount Leviathan lies on the western side of the Cloncurry River, a quarter of a mile above its junction with Chinaman Creek. The township of Cloncurry is within 1½ miles to the east-north-east. The highest point of the mountain is about 270 ft. above the adjacent red soil flood-plain.

The summit of the mountain is composed of dense hæmatite, with a little quartz. A chain to the west of the top the quartz veinlets are so frequent that the silica content is at least 10 per cent., and a great part of the mountain contains at least 20 per cent. silica. The southern end of the mountain is a little freer from quartz than the main mass.

Another rather siliceous crop, 1½ chains wide, is to be seen on the bank of the Cloncurry River, within ¼ mile of the Boulia Crossing, and only 15 ch. from the nearest part of the Mount Leviathan crop, with which it may be connected.

The quartzite crop, ¼ mile south of the mountain, is 2½ ch. in length and up to 20 ft. in width. It has a horny texture, and is most siliceous in the widest parts, but contains in some places 50 per cent. of iron ore. A little limonite, younger than the silica, also occurs here, but the granular iron-ore is quartz-veined, and therefore older. Other crops occur to the north-north-east, connecting this with Mount Leviathan.

A rough computation of the ore above the flats places it at a little less than 9,000,000 tons. This assumes that the whole of the mountain is iron ore, and takes no account of the fact that a great proportion is too highly siliceous to be looked upon as a source of iron at the present time.

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* E. and M. Jour. 23.3.07, p. 583. F. I. H. Merrill.

PISA HILL.

Pisa Hill lies ¼ mile south-south-east of the main Great Australia crop, above which it rises nearly 100 ft., its total height above the township being somewhat over 150 ft.

The upper part of the hill for 30 ft. from the summit is formed of dense iron ore—the southern part of a crop, 7 ch. in length and 70 ft. in greatest thickness. The crop ends abruptly at the south within a chain of the summit of the Hill, but to the north-north-east (the direction of strike) the deposit tapers slightly.

The main part of the crop consists almost wholly of crystalline hæmatite, with a very small amount of quartz. Northwards the ore is rather softer and less pure, but it is still high grade, with the exception of about a chain's length at the extreme northern end, which is very siliceous, containing 25% granular quartz, probably an original constituent.

Some of the ore is strongly magnetic, some only slightly so and some is quite non-magnetic. It shows internal slickensides, which may be either those of the original slates or, more probably, have

Slaty Creek.

A few chains east of the Timberoo lease three outcrops of hæmatite are to be seen. The southern crop is ½ ch. in length and up to 2 ft. wide, and is separated by only a few feet from the central crop, which is 1 ch. in length and 5 ft. in greatest width. The northern crop is ¼ ch. long and 5 ft. wide. The hæmatite is very fine grained, crystalline, and slightly magnetic.

The country is schist except at the southern end, where there is a crop of diorite. The iron ore appears to have replaced the igneous rock where schistose, for such structure is distinctly visible in hand specimens, the felspars only being unaffected.

Duck Creek.

Micaceous hæmatite occurs in bunches in calcite at the Belfast. (Q.v., Part II.)

Palmtree.

Black Mountain is six miles south of the Native Companion, and can be seen from near that mine. The main crop, stated to be dense hæmatite, is reported to be 100 yds. wide and 500 yds. long, and it rises several hundred feet above the level country.

Crusader.

Small bodies of hæmatite were noticed at the Crusader. (Q.v., Part II.)

Hampden.

Magnetite is reported to occur at Mount Sylvia. (*See* Hampden, Part II.)

Florence.

Turgite has been described as occurring at the Trump. (Q.v., Part II.)

Hæmatite was seen at the Dandy. (Q.v., Part II.)

Chinaman Creek.

A small crop of hæmatite occurs on the Thistle. (Q.v., Part II.)

Mount Oxide.

Two of the crops of iron ore, mentioned in Part II. of this report, occur in the north-eastern part of M.L. 282. The main crop extends westwards from the Caves to within a chain of the northern shaft on the shear-zone. On the eastern side of the lease it spreads out north-westwards for 2 ch., where it becomes very impure, being practically simply a ferruginous siliceous slate. A chain to the north is the third crop, which is impure and not of any considerable extent. It rises to within 10 ft. of Camp Peak, the highest point on the line, and 250 ft. above the Caves.

The largest ironstone crop is that at the Caves (in Mount Oxide No. 1 East) on the western side of Cave Creek and east of Mount Oxide. Its width, just above the creek, is 100 yds., but the country for a chain beyond to the north is very ferruginous, and may possibly be cupriferous at a depth. Westwards the crop, which towers 100 ft. above the creek, contracts somewhat to a width of two chains at five chains from the shaft, and then spreads out obliquely for 5 chains to the north-west. Across the creek to the east there is little sign of iron ore, its absence being due to the occurrence of a big north and south fault near the creek, the continuation of which to the south is indicated by the abrupt discontinuity of the outcrops of the strata.

The iron ore consists in great part of earthy turgite, which has replaced slightly contorted clay-slates, but crystalline hæmatite occurs in considerable quantity, especially in cavities and between laminæ and bedding planes. The unequal hardness of different parts of the body has caused it to weather most irregularly, with the production of many caves and shelters. In these caves slight and doubtful traces of copper stains can occasionally be seen. The dip of the original sedimentaries can be made out in the cliffs at about 15° to the south.

The frequently loose and cellular nature of the ore, together with the green stains, points to the former existence of copper-bearing sulphides in it, the present barrenness being due to leaching, whereas there is some slight hope of rich ore being found on sinking in crystal plates of hæmatite in films and bunches between laminæ. There is a little contorted kaolinised slate, in process of replacement by iron ore, which, with the laminated character of the mass, indicates its origin to have been by metasomatic interchange. Some of the ore has a decidedly gossany appearance, and minute traces of copper can be determined chemically in picked pieces, while an occasional speck of malachite may be detected on close inspection. No free silica is present. The following is the result of analysis (Government Analyst):—

$$\left.\begin{aligned}\text{Total Fe} &= 51{\cdot}30\%\\ SiO_2 &= 15{\cdot}90\\ S &= 0{\cdot}46\\ P &= 0{\cdot}08\\ Cu &= \text{nil}\end{aligned}\right\}\begin{array}{l}\text{Gold} = 20\text{ gr. per ton.}\\ \text{Silver} = 2\text{ dwt. per ton.}\end{array}$$

Occurrences Beyond Queensland.

TASMANIA.

In connection with the widespread occurrence of hæmatite bodies in the Cloncurry district, the first reference should be to that at Mount Lyell; but, unfortunately, no satisfactory theory of the genesis of the latter has been offered.

Prof. Gregory, the last to write on the field,* says:

> It is of course obvious that the Iron Blow was not formed by the simple alteration of the pyrites by surface water and air; for in that case the iron would have been present as a hydrous oxide of iron, such as limonite, instead of as hæmatite. It is accordingly most natural to regard the Iron Blow as some type of lode formed under conditions which have lead to the deposition of red hæmatite from iron solution. . . The iron was probably leached from pyrites in the underlying rocks, and was precipitated along the fault lines, where the ascending waters, containing iron salts, met other solutions which had worked their way downward through the conglomerate.

WYOMING.

There are here† metamorphosed and mashed pre-Cambrian sedimentary and igneous rocks—siliceous limestones, mica-schists, altered sandstones, and gabbros, diorites, and altered porphyries (the last group producing hornblende and chloritic schists), and intrusions of granite, followed by aplites and pegmatites.

Iron ore deposits are found in schist above limestone, the ore replacing schist. The lenses are irregularly elongated parallel to the strike of the metamorphic sedimentary rocks in which they occur, from a few feet to 100 ft. or more wide, and up to 1,000 ft. in length, and proved to 900 ft. depth.

The chief ore is hydrated hæmatite, and the gangue minerals are calcite, quartz, gypsum, chalcedony, biorite, and a kaolin-like mineral,

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* The Mount Lyell Mining Field, Tasmania, with some account of the geology of other pyrite ore bodies. By J. W. Gregory, D.Sc., F.R.S., etc., Melbourne, 1905.

† Hartville Iron-ore Range, Wyoming. By Sydney H. Ball. U.S.G.S. Bull. 315, p. 190.

with copper ores. The ore probably averages 60 per cent. iron. T
iron was deposited by descending water, and was derived from magn
tite and pyrite of the schist above (dissolved as carbonate).

GOLD ORE DEPOSITS.

Mr. Jack* describes the occurrence of gold in association wi
copper at the Flying Dutchman, and with calcite and chalybite at t
Uncle Tom Mines (Pumpkin Gully); with native bismuth at the Ma
Douglas (Top Camp); with mundic at the Gilded Rose (Bishop
Creek); and with calcite at Weatherley's (Weatherley Creek).

Mr. Rands, in a later report,† gives additional information
some of the above, and besides full descriptions of the Bowerbir
Soldier's Cap, and Bell's Camp fields, and the Last Call Mine.

Very little gold-mining has been done since Mr. Rands's visit, a
no examinations were made by me, but several references to t
occurrence of gold will be found in the former portions of this repor

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* G.S.Q. Publication No. 136.

† G.S.Q. Publication No. 104.

By Authority: George Arthur Vaughan, Government Printer, Brisbane.

Queensland.

DEPARTMENT OF MINES.

Queensland Geological Survey.

(B. Dunstan, Government Geologist.)

PUBLICATION No. 210.

CLONCURRY COPPER MINING DISTRICT.

PART 2.

WITH 1 MAP, 76 PLANS, AND 25 FIGURES.

BY

LIONEL C. BALL, B.E.,
ASSISTANT GOVERNMENT GEOLOGIST.

BRISBANE
BY AUTHORITY: GEORGE ARTHUR VAUGHAN, GOVERNMENT PRINTER, WILLIAM STREET.

1908.

Queensland.

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ERRATA.

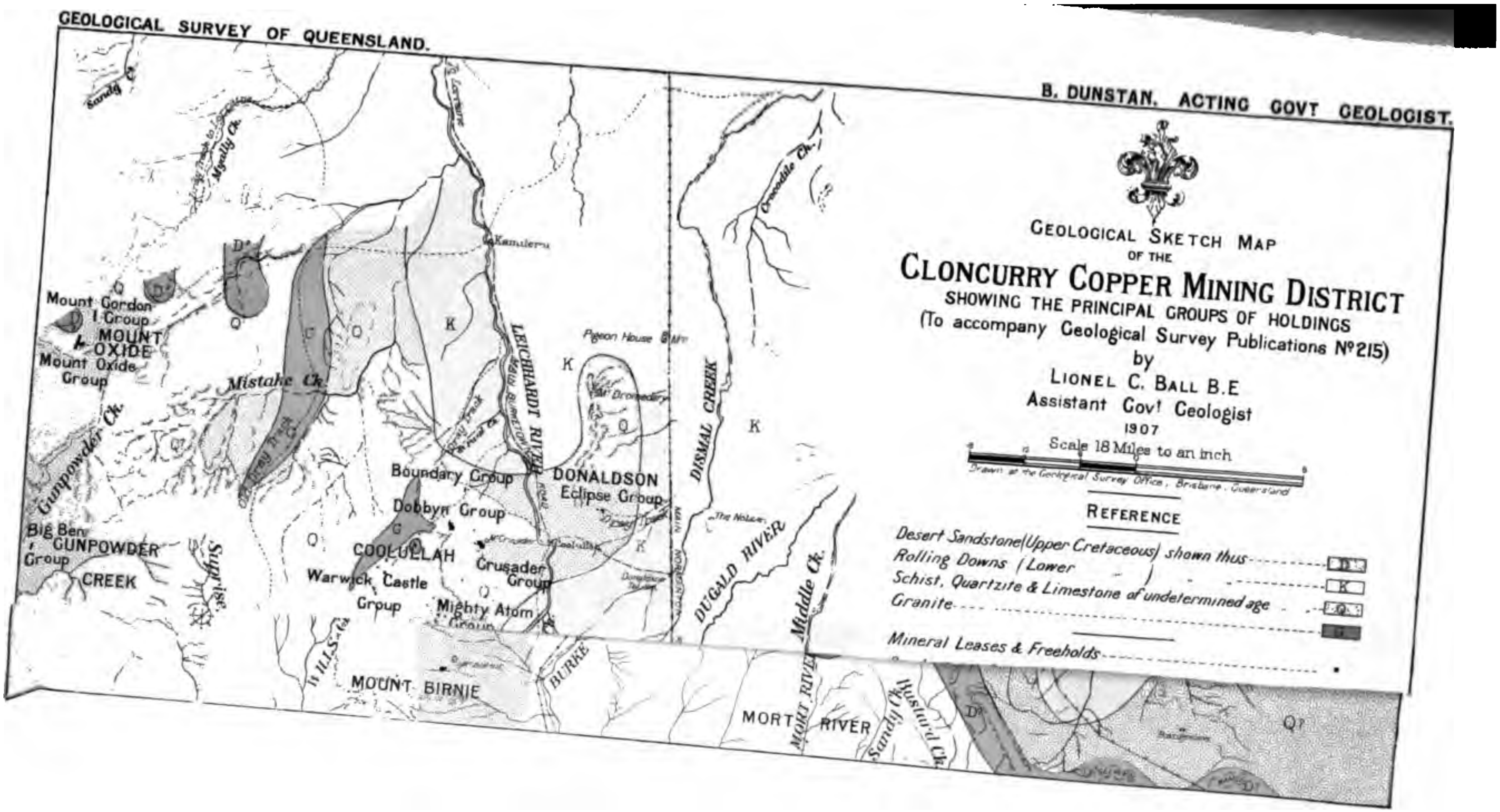
Page 12.—Above **Labour Victory (R.C. 29)** *read* Agate Downs Group.

Page 17.—On Plan of Duchess and Ivanhoe Groups, for No. 3 on M.L. 427 *read* No. 2.

Page 103.—For M.L. 161 *read* M.C. 161.

Frontispiece.—There is insufficient evidence to warrant the inclusion of the three patches of Desert Sandstone (marked with a query) between Mount Oxide and Kamileroi, and they should therefore be omitted.

Frontispiece.—An area of granite about 15 miles long and 10 miles wide should be shown between the heads of the Dugald



GEOLOGICAL SURVEY OF QUEENSLAND.

B. DUNSTAN, ACTING GOVT GEOLOGIST.

GEOLOGICAL SKETCH MAP
OF THE
CLONCURRY COPPER MINING DISTRICT
SHOWING THE PRINCIPAL GROUPS OF HOLDINGS
(To accompany Geological Survey Publications Nº 215)
by
LIONEL C. BALL B.E
Assistant Govt Ceologist
1907

Scale 18 Miles to an inch

Drawn at the Geological Survey Office, Brisbane, Queensland

REFERENCE

Desert Sandstone (Upper Cretaceous) shown thus ---------- D
Rolling Downs (Lower) ---------- K
Schist, Quartzite & Limestone of undetermined age ---------- Q
Granite ---------- G

Mineral Leases & Freeholds ---------- •

NCURRY COPPER MINING DISTRICT.*

PART II.

MINERAL HOLDINGS.

This part of the report is limited to individual descriptions of ines, all other matters having been considered in the first part.

Though the whole country has been divided into counties, hes, runs, and blocks, these divisions are seldom made use of in ing the mines. Locally, each part of the district is known by ame of some natural feature, such as a mountain (Soldier's Cap) river (Corella), or by that of a settlement (Hampden). In desng the mines it is usual to refer those on a single lode or within cumscribed area to a single group. The local nomenclature, e consistent, has been followed in this report in the naming stricts and groups, the former coming below in their order from to north.

The leases and freeholds mentioned below have been located on a of the Cloncurry district published with the Annual Report of Jnder Secretary for Mines for the year 1906;† and most of the ps are shown on the small map attached.

This report has already appeared in the *Queensland Government Mining Journal* e, 1907, *et seq.*, but has been rearranged for this publication, in which will also nd some additions, chiefly of mineral holdings not visited by me.

Later issued as G.S.Q. Publication No. 218.

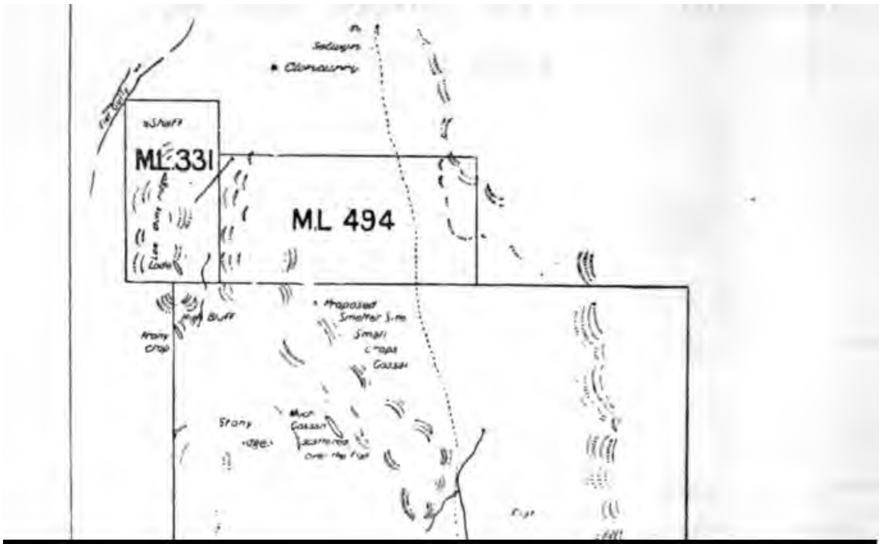
MAGGIE'S CREEK.

Maggie's Creek, which rises on the low divide, known as the Selwyn Range, has a run northwards into the Cloncurry River of little over ten miles.

The only mines working at the end of the year 1906 were the Mount Elliott and the Labour Victory.

MOUNT ELLIOTT GROUP.

The Group includes reward claim No. 3 and mineral leases Nos.—331, 358, and 494.



Mount Elliott (R.C. No. 3, Etc.).

(Mgr., G. A. Waller).

LOCATION.

The claim and leases are located on a low divide between two of the upper branches of Maggie's Creek, a short tributary of the Cloncurry River, 58 miles south of Cloncurry and 1,400 ft. above sea level.

The new township of Selwyn has lately been laid out, ½ mile north of the workings.

The mine is connected with Cloncurry by a good road running down Maggie's Creek, across the Cloncurry River, into Hampden; then across the Florence River and down the Cloncurry River (crossing it twice) to the township. An alternative route (but now seldom used) is down the Cloncurry River, *viâ* Devencourt, across the Dugald River to Duck Creek.

The latest proposed tramway route from Mount Elliott leaves the coach road at the Florence, and makes a slight detour to the westward to take in the Duck Creek group.

TOPOGRAPHY.

The Mount Elliott divide crosses a shallow valley carved out of an old pene-plain, of which only flat and topped ridges and hills, rising 150 ft. above the present valley bottom, now remain. The strata for some depth below the surface of the old pene-plain have been rendered very ferruginous, and are especially subject to irregular weathering, allowing the formation of caves.

Mount Elliott, being near the divide, is one of the driest localities of the district, and it has been necessary to devise methods of water conservation to ensure the successful exploitation of the mine. One of the first proposals was to pump water from a well at the Boomerang waterholes, six miles down Maggie's Creek. It has also been proposed to construct a dam in one of the gorges at the head of Maggie's Creek, but the present supply, which is believed to be sufficient, is obtained from two wells a short distance south-east of the mine.

HISTORY.

During the second quarter of 1901 Mount Elliott was placed in the hands of a Melbourne Option Syndicate, who sank a shaft 50 ft. and, by crosscutting during the third quarter, proved 37 ft. of solid ore—at a cost of £6 per foot.

In the following three years little was done beyond well sinking, but toward the end of 1905 the shaft was deepened to 100 ft.

The Linedale Syndicate then secured a working option for 12 months, and early in 1906 a company was floated in Melbourne. Extensive developmental work was at once begun, and carried on till the end of the year. The unusually complete surface plant necessary in so remote a locality is now in full working order, and the erection of a smelter is being proceeded with.

From the manager's reports published in the Brisbane Press since my visit, the following has been culled:—

22/2/07.—Western crosscut at 185 ft. level back from No. 1 winze (below No. 2 crosscut) advanced 18 ft. in sandstone, with iron pyrites in the end, and a lode formation 2 ft. wide, with veins of rich ore 6 in. wide (footwall lode?).

No. 2 inclined shaft opencut 19 ft. deep.

2/3/07.—Footwall veins struck at 32 ft. in crosscut from main shaft at 185 ft. level 4 in. to 2 ft. wide—40 % copper.

Hard ferruginous ore struck in crosscut at 23 ft. from the No. 1 winze—4 % copper

15/3/07.—Low grade gossan struck at 40 ft. in crosscut from main shaft at 185 ft level—4 ft. 6 in. wide.

Footwall vein in north-western drive 4 ft. wide—45 % blk. oxide and glance.

No. 2 inclined shaft 40 ft. deep.

29/3/07.—Main ore body cut in north-western drive (total 17 ft.) on 185 ft. level at 10 ft. from the shaft—7 % copper.

27/4/07.—Footwall vein in 185 ft. level main crosscut composed of kaolin, with two principal bands of rich glance, totalling 4 ft. in thickness, and averaging when bagged 41 % copper, but pinched out northwards in 15 ft. Crosscut then put across the lode to connect with No 1 winze, proving main ore body to be 18 ft. wide, and proved for 30 ft. north-west from the main crosscut. [Mr. Waller kindly sent me this information.]

1/5/07.—North-west drive (125 ft level)* 30 ft. long in hard ferruginous ore, containing 2 % Cu.; 9 ft. drive on hanging-wall kaolin.

Unfortunately my visit was a hurried one and made during Mr. Waller's absence, and consequently without his guidance and local knowledge. His officers, however, gave me every facility in making the examination.

LITERATURE.

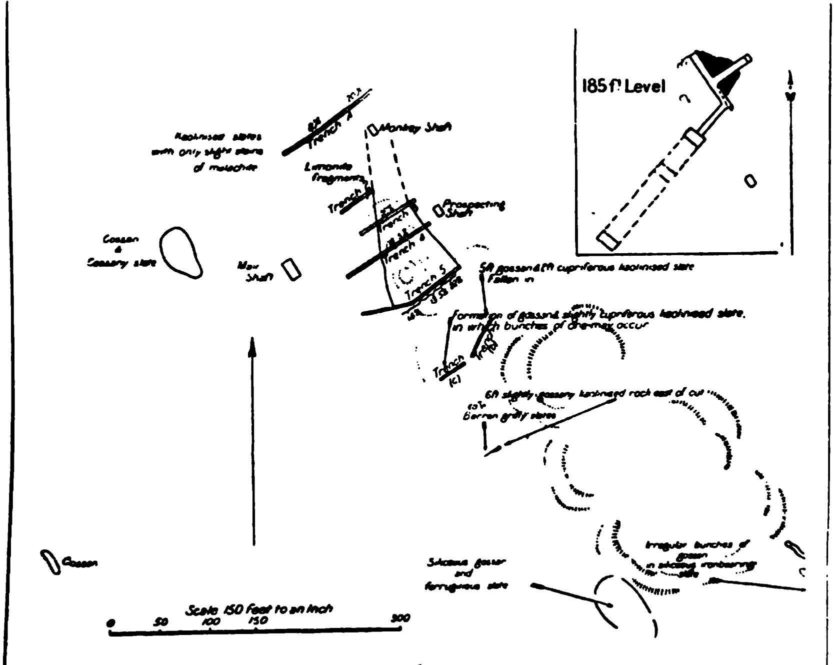
gold per ton, but the additional work done allows him to calculate the ore in the main body above the 125 ft. level as 45,000 tons. This, however, appears to only partly include the rich kaolin ores referred to.

AREA.

Reward Claim No. 3 on which the workings lie is square and 160 ac. in area. Mineral Lease No. 331 of 10 ac. at the north-western corner of the reward claim and M.L. 358 of 20 ac. at the south-western corner were taken up on the line of strike of the ore bodies. M.L. No. 494 of 20 ac. has been secured as a works site.

DEVELOPMENT.

The north-western trench (No. 1 or *a*) is 20 ft. north-west of the monkey shaft, and is 1 ch. in length.



Kaolinised slates with only slight stains of malachite
Trench 1
Monkey Shaft
Limonite fragments
Trench 2
Trench 3
Prospecting Shaft
Trench 4
Trench 5
Gossan & Gossany slate
New Shaft
5ft gossan & 6ft cupriferous kaolinised slate Fallen in
Formation of gossan & slightly cupriferous kaolinised slate, in which bunches of chermes occur
Trench (K)
6ft slightly gossany kaolinised rock east of cut
Barren gritty slates
Irregular bunches of gossan in siliceous ironbearing slate
Siliceous gossan and ferruginous slate
Gossan
185 ft Level
Scale 150 feet to an inch
0
50
100
150
300

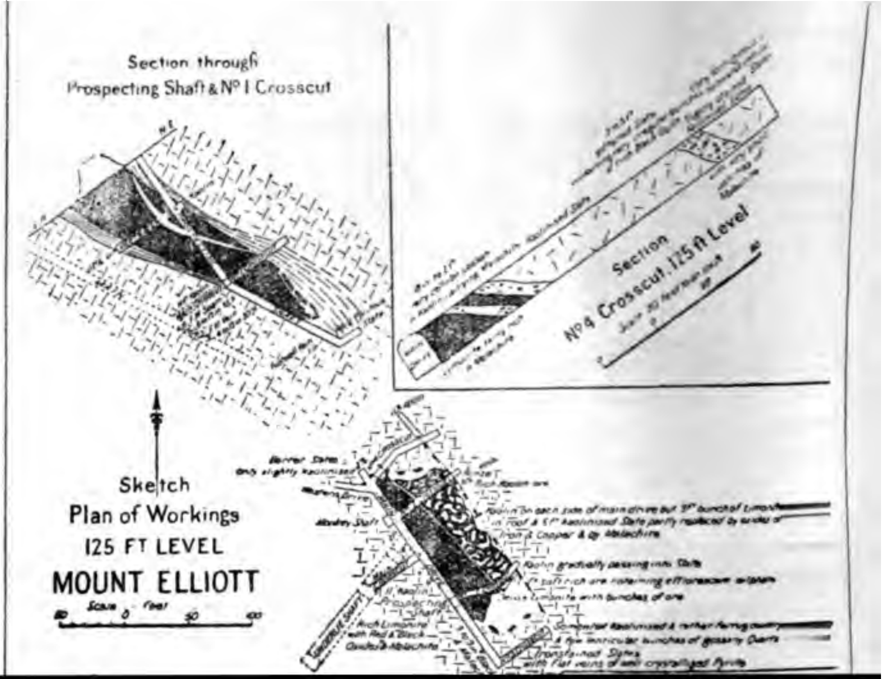
SKETCH PLAN, SURFACE AND 185-FT. LEVEL, MOUNT ELLIOTT.

The following four trenches have been opened since my inspection:—

No. 2 trench, 50 ft., south-east of No. 1 is 30 ft. long.
No. 3 trench, 20 ft. beyond, is 50 ft. long.
No. 4 trench, 25 ft. beyond, is 70 ft. long.
No. 5 trench, 35 ft. beyond, is 90 ft. long.

The eastern trench (No. 6 or *b*), 35 ft. long, about 10 ft. east of the main crop.

it is understood that the ore-body was cut at 40 or 70 ft. (it is not quite clear which) below the surface, and the footwall kaolin at 115 ft. The ore in the shaft averages 17·8% copper, with a trace of gold. Crosscuts at the 50 ft. level prove the body to be there 55 ft. wide, and to carry 15% copper, with 3 dwt. gold per ton. The crosscut at


Section through
Prospecting Shaft & Nº I Crosscut
Section
Nº4 Crosscut, 125 ft Level
Sketch
Plan of Workings
125 FT LEVEL
MOUNT ELLIOTT
Scale Feet
0
50
100
Barrier Slate
only slightly kaolinised
Mackey Shaft
Rise
Rich Kaolin ore
Kaolin on each side of main drive but 3" bunch of Limonite in roof & 51" kaolinised Slate partly replaced by oxides of Iron & Copper & by Malachite
Kaolin gradually passing into Slate
soft rich ore containing efflorescent sulphates
Limonite with bunches of ore
Kaolin
Prospecting Shaft
Rich Limonite with Red & Black Oxides & Malachite
Somewhat kaolinised & rather ferruginous country
A few lenticular bunches of glassy Quartz
Transformed Slates with flat veins of well crystallized Pyrite

rable from the limonite. The comparative youth of these siliceous osits is shown by their having been precipitated round stalactites of ysocolla (Fig. 1), which must have leached out of the gossan, and

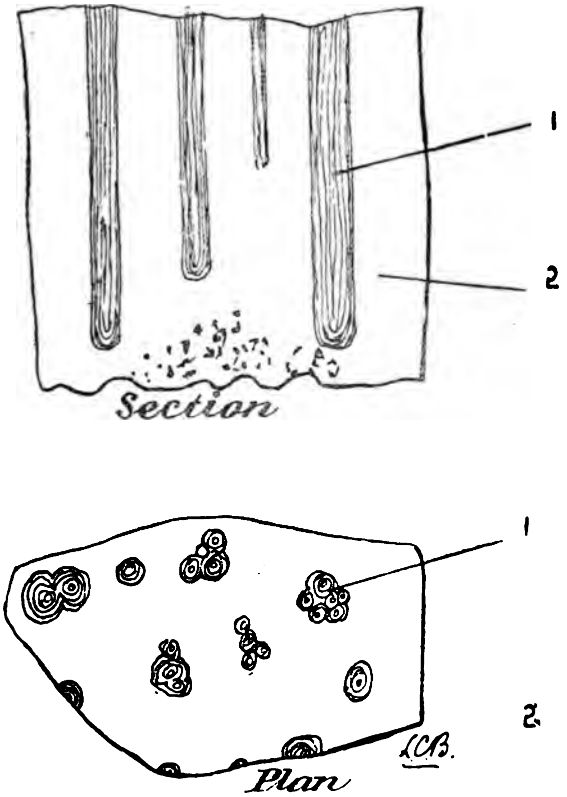


FIG. 1. (NATURAL SIZE)—SECONDARY ORE, MAIN CROP, MOUNT ELLIOTT.

(1). *Stalactitic chrysocolla.*
(2). *Chalcedony enclosing chrysocolla.*

r chalcedonic nature is indicative of their having been deposited in the zone of weathering. The crop has been trenched since my , and samples have been assayed as below:—

No. 3 trench, 30 ft. width of ore—
    Copper 18% and gold 3 dwt. per ton.
No. 4 trench, 40 ft. width of ore—
    Copper 16·5% and gold 2 dwt. per ton.
No. 5 trench, 58 ft. width of ore at southern end of crop—
    Copper = 15·2% and gold = 2 dwt. per ton.

The prospecting shaft, which was begun in the hanging-wall try, was inaccessible to me, but from Mr. G. A. Waller's reports

3 to 5 ft. of softened slate, containing very irregular bunches of rich secondary sulphide; and this is followed by slightly stained kaolinised slates (say, 2% copper), the country in the face being very ferruginous and somewhat cellular, with very small patches of malachite. This also should be further prospected.

The western drive, when seen by me, was only 6 ft. long, in rich oxide and carbonate ore, with bunches of red jasperoid, probably averaging 20% over a width of 10 ft. It has since been proved that the ore pinches out 17 ft. from the main drive.

The footwall seam was first struck in the prospecting shaft between the kaolin and slate, at the 125-ft. level, where it consisted of black ore, 6 in. to 12 in. wide, containing 35% copper. Its average width on the 125-ft. level is 2 ft., and its composition as given above. It has been proved for 46 ft. below the 125-ft. level to average between 25 and 35% copper, and to vary between 3 in. and 15 in. in thickness, but pinching below to 1 in.

In trench (*a*), to the north-west of the crop, only kaolinised slates, with slight stains of malachite, can be seen. Mr. Waller sampled this, and found 60 ft. to average 8% copper and 10 ft. (hard ore) 20%.

In No. 2 trench, also to the north-west of the ore-body, 12 ft. of cupriferous kaolin has been exposed.

Trench (*b*) shows 5 ft. gossan and 2 ft. cupriferous kaolinised slates; and in trench (*c*) there is a formation of gossan and slightly cupriferous kaolinised slate, in which bunches of ore may be found.

Trench (*d*) shows only barren, gritty slates, but at the eastern end 6 ft. slightly gossany kaolinised rock can be seen. This becomes more gossany towards the south, and at 1 ch. from the trench is 3 ft. wide.

Much gossan occurs scattered over the flat about 15 ch. north-west of the main crop. This should be prospected, as it is apparently on the line of strike of the main lode.

Some trenching ½ mile north-north-west of the mine has revealed silicate ore in speckled schist, with small patches of gossan.

ORE RESERVES.

The latest estimation of the amount of ore proven above the 125-ft. level is that by Mr. Waller: 45,000 tons averaging 16·4% copper and 2 dwt. gold per ton. This refers only to "hard ore," similar to that in the main crop, the large bodies of kaolin ores being omitted because of their irregular development and the small amount of work done on them.

As to ore below the 125-ft. level, there is every probability of the main body pitching to the north-west as first predicted by the present manager, but no work had been done to prove this at the time of my visit. The gossan has been formed from sulphides, which are to be expected below the water-level, and may contain anything from, say, 3% to 30% copper. In the neighbourhood of the water-level there ought, however, to be considerable secondary enrichment, and chalcocite and cuprite may there be found almost replacing the limonite and original sulphides.

GEOLOGY.

These ore bodies occur in an area of upturned slates and schists, presumably part of the great province of Cloncurry, which there is some reason to regard as Pre-Devonian. The separate bodies in the vicinity of the main Mount Elliott outcrop make little show above the ground, and cannot be traced for any great distance; yet there is a possibility of any of them increasing greatly in size below the surface.

In my opinion, the ore bodies do not lie on true fissures (extensive dislocations of the crust, allowing relative movements of great masses of country on opposite sides), but follow the bedding of the enclosing strata. The sulphides may have been given off from deep-seated intrusives at the time of their cooling. The bedding planes will have allowed almost as free passage as a fissure, and when precipitation has been brought about at any point from any cause deposition is likely to have been continued there by metasomatic interchange with the country rock. In this way may have been formed either a succession of leases or one long pipe (shoot), but which it is can only be proved by sinking. Crushing of the country may have been caused either by expansion during replacement, or, more likely, in oxidation of the original pyrite and chalcopyrite to limonite, when kaolinisation of the adjacent country took place.

The formation of the kaolin ores would follow the oxidation of the sulphides, kaolin exerting a powerful precipitative action* on the copper-bearing solution leaching from the main body. These rich ores are, therefore, not to be expected below water level, and instead of kaolin there will be barren or, at most, pyritous slates.

Labour Victory (R.C. 29).

Location and Area.

The Labour Victory is located in the southern part of the Agate Downs Goldfield, 53 miles south of Cloncurry.

Its area is 40 ac.

History.

This reward claim was granted in July, 1903, and has been worked spasmodically till the present as the following historical notes show :—

July, 1903.—Reward Claim granted and ore being raised.
Jan., 1905.—Work resumed.
Mar., 1905.—Shaft 35 ft. deep; lode 4 ft. wide.
Sept., 1905.—Shaft 52 ft. deep and new shaft started.
Feb., 1907.—Syndicate formed. Total of 85 tons ore obtained.

Development.

The workings include a trench 6 ft. deep and 20 ft. long at the north end, besides one or two other shallow cuts; two potholes 8 ft.

ORE-BODIES.

There appear to be at least three overlapping and nearly parallel lines here, but the only body of copper ore of any size is that at the main shaft. This may yet be proved to increase in size in depth but the present exposure warrants energetic development.

In the northern trench is an 18 in. nearly vertical body of limonite and quartz carrying bunches of ore. The strike is like that of the country rock here only slightly altered.

Half a chain south of the cut there is a crop of gossan apparently on the continuation of the above body, which has not been proved further south.

Just to the north of the new shaft is a blow, a chain long and up to 6 ft. in width, of limonite and quartzite—probably the cap of a rich siliceous pyritic lens.

The new shaft was sunk in kaolinised slates on, it is reported, a 2 ft. seam of quartz. There is only about a ton of ore at grass, consisting of a mixture of earthy black oxide and green carbonate of copper.

The 12 ft. pothole was opened on the eastern side of a quartz blow, but there is no justification for its continuation.

The main shaft shows a 5 ft. formation near the surface, but in the southern stope an average of 6 ft. has been removed between the 10 and 35 ft. levels, and even that is not the whole width of ore. In the northern face there is standing 5 ft. of slightly siliceous red ore (tile ore containing much malachite and probably assaying 35% copper) which would appear to be a rich shoot pitching northwards from the shaft, where 46½% ore was broken down. On the west of it is a foot of gossany material, and then kaolin (as on the east, where the schistose structure is discernible). The ore is poorer in the floor of the drive, and is said to have pinched below, in the shaft which was unfortunately inaccessible. The greater part of the ore shipped from the mine has come from this shaft and the opencut to the south. The firsts include an earthy black chalcocite, sometimes irregularly veined and impregnated with acicular malachite and occasionally showing scattered granules of pyrite evidently in process of replacement by the secondary sulphide. The chalcocite sometimes changes imperceptibly into limonite, in which also grains of unoxidised pyrite can be detected. When inspected the seconds at grass amounted to 70 tons, and comprised carbonate in gossan and replacing kaolinised slates, but generally free from silica and probably carrying 20% copper. The heap is made up in part of carbonate veined tile ore, and the precipitative action of clay is clearly indicated by the zone of earthy malachite surrounding fragments of clay slate in the ore. Besides this ore, the "thirds" at grass amounted to 20 tons—dense limonite, with a slight impregnation of malachite, containing between 10% and 15% copper. Some pyrite is visible in the interior of the limonite blocks raised.

In the southernmost pothole there is 12 to 18 in. of gossan dipping eastwards in green stained kaolinised slate, but only ½ ton of ore has been shipped from here.

In the pothole a chain to the north of this there is under an 18 in. to 2 ft. cap of quartz, an irregular formation up to 5 ft. in thickness, with small rich lenses of gossan and malachite in kaolin (decomposed clay slate).

A small bunch of 37% ore (1½ ton) lay 30 ft. east of the main shaft.

Fluxiana (M.L. 414).

Mgr., G. A. Waller.

LOCATION, ETC.

The Fluxiana is on Cave Mountain, near Maggie's Creek.

Its area is 20 ac. The ground held by the Mount Elliott Company for the supply of flux. It was not visited by me.

HORSE CREEK.

Horse Creek also rises on the Selwyn Range, but some miles to the west of Maggie's Creek. Its general course into the Cloncurry River is north-north-westwards.

HORSE CREEK GROUP.

In this group, which lies 50 miles south-by-west from Cloncurry, are included only the leases giving it the name, but it is understood that developments have lately taken place in the neighbourhood on Boomerang Creek. Rich specimens, consisting of chrysocolla in kaolin and of intermixed malachite and tile ore, have been brought to me from the latter locality.

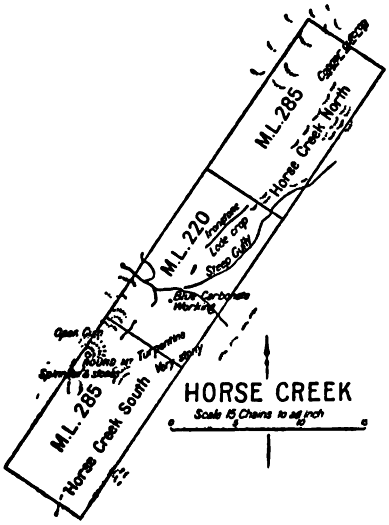
In travelling from the Duchess to Mount Elliott my route took me through Horse Creek country, the mine being missed through incorrect directions having been given me. Topographically the country shows little diversity, there being only slight and rounded rises and shallow depressions. The rocks seen were chiefly silicified slates and quartzites.

Horse Creek (M.L. 220, Etc.).

Mgr., Matheson.

LOCATION.

These leases are located on one of the head branches of Horse Creek, 50 miles south-by-west from Cloncurry, and 3 miles north-east of the south-eastern corner of Devoncourt No. 5 run block. They are about 7 miles from the Devoncourt-Hampden road, and, as work had not begun here and a guide was not available, no attempt was made by me to find them.



AREA.

The five leases here, each 10 ac. in area, are Nos. 220, 285 (1 South), 286 (1 North), 559 (2 South), and 560 (2 North). They are the property of the Mount Merlin Copper Company.

DEVELOPMENT.

The manager's reports in the Brisbane Press state that 6 men began in January of this year, to open-cut the lode at the northern end of the lease. In April a shaft had been sunk 16 ft.; an old shaft on the No. 1 South was being cleaned out, and in May the vertical shaft was 60 ft. deep.

OUTPUT.

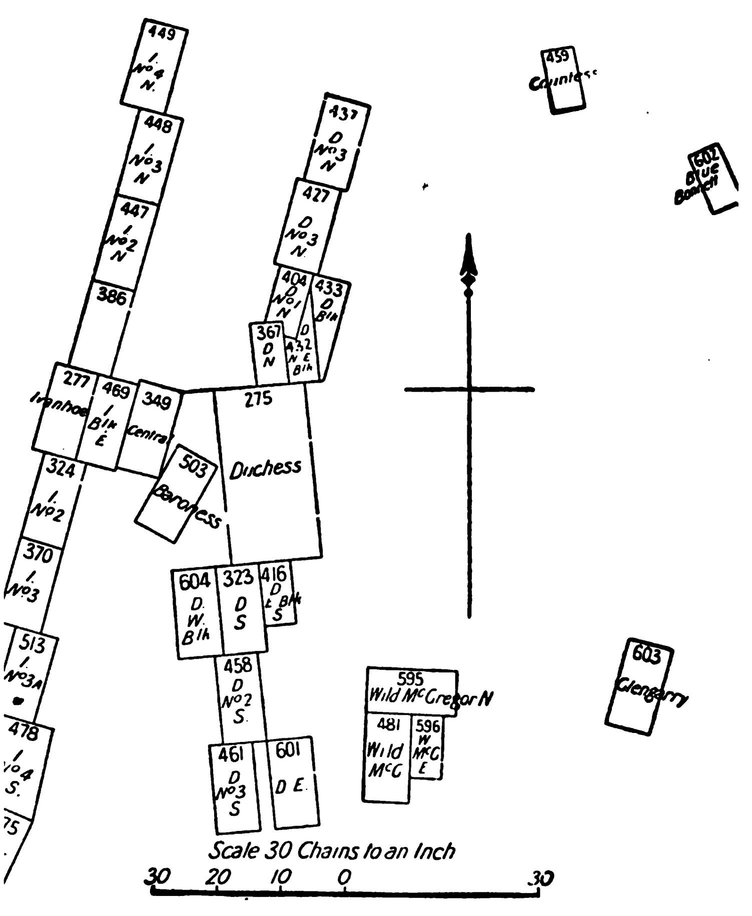
1897— 3 tons ...	...	shipped by Brady, prospector—47½ % copper
1905—13 „ ...	...	

ORE DEPOSITS.

Mr. Brady, the prospector, informed me that veins of ore occur over a width of 60 ft. in schists. Warden Cherry has stated that the outcrop resembles that at Hampden, and the manager reported: "The main outcrop is a peculiar jumble of schists quartz and kaolin, all more or less heavily impregnated with copper carbonates and red oxide." It is shown on the surveyor's plan running north-east. In

BURKE RIVER.

These groups, which are between 60 and 70 miles south-west of ncurry, comprise a large number of leases on the Duchess, Ivanhoe, d MacGregor, Pilgrim, and other lines. Reference will be made ow only to the principal leases.



DUCHESS AND IVANHOE GROUPS.

Geologically the Burke River district has several points of simi- ty with the country in the immediate vicinity of Cloncurry— estones, partially replaced by quartz and iron oxide, occurring er similar conditions in the A1 freehold and on the Ivanhoe (and rim ?) leases. The beds of indurated felspathic sandstone are, ever, characteristic of the Duchess.

DUCHESS GROUP.

The Duchess Group is here made to include besides the Duchess, the Ivanhoe, Wild MacGregor, and others more usually referred to separately. Leases in force on the various lines not here described are shown on the attached plan.

Duchess (M.L. 275).

C. L. Smith—Gen. mgr.

LOCATION.

The Duchess lies on the northern bank of Jack's Creek, one of the upper branches of the Burke River, 61 miles south-west of Cloncurry. The track to the mine leaves the Cloncurry-Urandangi road at a gate 4 miles west of Devoncourt station, the total distance to Cloncurry by road being 73 miles.

It is situated in a nearly flat bottomed north and south valley, with rocky hills on either side.

AREA AND HISTORY.

M.L. 275 has an area of 40 ac., and is the property of the late owners of the Hampden Copper Mines.

In Feb. 1906 the original holders sold the lease for £15,000 to the Hampden-Cloncurry Copper Mines Limited, and since development has been steadily carried on.

LITERATURE.

For titles of reports numbered as below see Introduction.

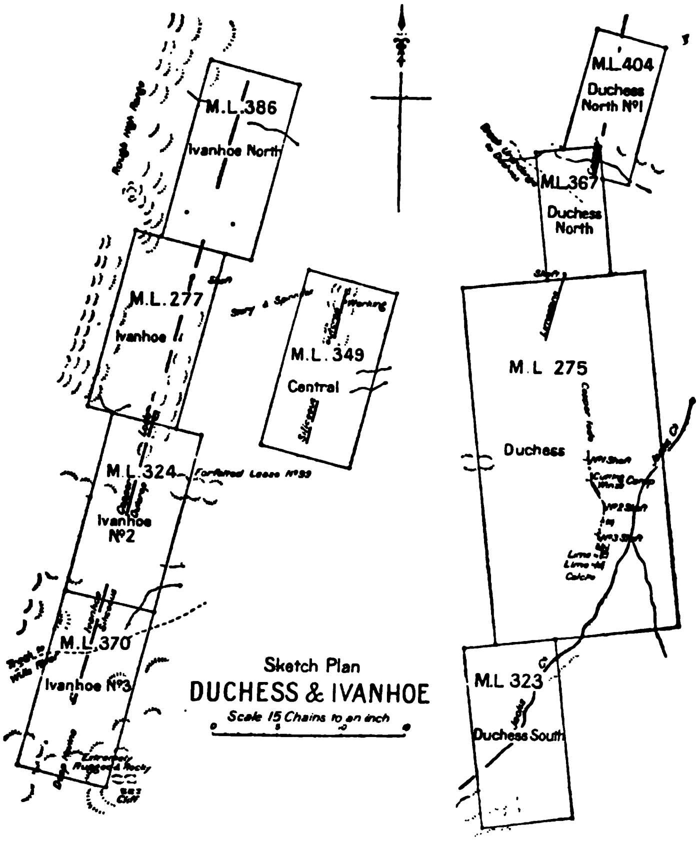
(4) Under the description of the Pilgrim Creek Leases Mr.

Development.

The workings at the time of my visit were as follow:—

Four *trenches*: (a), 1 ch. south of No. 2 shaft; (b), ½ ch. south of No. 3 shaft; (c), 1 ch. south-south-west of No. 3 shaft; and (d) ¾ ch. beyond (c);

An *open cut* is, 2½ ch. long, 6 ft. wide and 12 ft. deep. The northern part is now being worked down in three benches.



Sketch Plan
DUCHESS & IVANHOE
Scale 15 Chains to an inch

A *winze*, 20 ft. deep, is near the centre of the open cut.

No. 1 shaft, the northernmost, is in about the centre of the lease a little over a chain north of the open cut. It is 55 ft. in total depth, and drives have been opened at the 45 ft. level for 40 ft. north and 60 ft. south. The drives were being extended when visited.

No. 2 shaft, 1 ch. south-south-east of the open cut, is 73 ft. deep. At 45 ft. depth a drive has been carried 15 ft. south and several feet north.

No. 3 shaft, 2½ ch. south-south-west of No. 2, is 52 ft. in total depth, and has drives at the 45 ft. level, 60 ft. to the south, and 66 ft. to the north.

OUTPUT.

1905—11$\frac{13}{20}$ tons shipped, containing ... ... 46% copper
1906—26$\frac{17}{20}$,, ,,
500 ,, at grass ,, ... 35% ,,

GEOLOGY.

The country to the south of the workings is a pink indurated granular felspathic rock—probably once a sandstone—apparently striking north-east, though the evidence is not conclusive, it being difficult to distinguish between jointing and bedding planes, except where, as in the southernmost shaft, indistinct ripple marks are visible. In the other workings sandstone, slate, and schist alternately form the enclosing walls, and that alone points to the ore-body crossing the strata, but nevertheless there is not sufficient evidence to call this a fissure lode. It is more probably a succession of lenses on a crush zone. The dip of the ore-body is almost vertical, any underlie being to the west.

Water level is 50 ft. from the surface, and in No. 2 shaft water is making at the rate of 3,000 gall. per 24 hrs.

ORE-BODY.

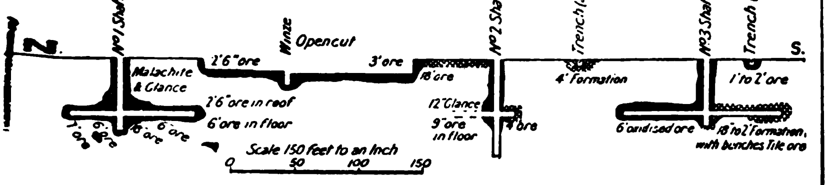
It is understood that the ore originally rose several feet above the ground but the crop had been removed prior to my visit, when little could be learnt from an examination of the surface, beyond the open cut, of underlying ore-bodies.

The southernmost *trenches* (*c and d*) show nothing of the ore-body, though there is much sinter in the decomposed country and coarsely crystallised calcite crops just beyond.

Besides this some 15 tons have been bagged, and there is over 100 tons of high grade ore in the tip. At the time of my inspection besides that bagged some 80 tons of unsorted ore, chiefly malachite and glance, lay at the cut.

The southernmost *shaft, No. 3,* has been sunk where the surface indications are not very favourable, and unfortunately no great improvement has taken place at a depth. In the southern drive on the 45 ft. level the eastern wall, dipping steeply to the west, is seen to be well slickensided. In the face the formation, only 18 in. to 2 ft. wide, consists of crushed country with quartz lenticules and bunches of tile ore stained with malachite, but nearer the shaft bunches of gossany tile ore are rather more abundant. The northern drive proved an average of 6 in. of oxidised ore (25% copper), but in the face there is 9 in. carbonate-bearing tile-ore which will probably average 30% copper, and in one place there is 2 ft. of formation, with lenticular bunches of ore and quartz. It is, however, not very well defined. The country rock is a felspathic sandstone proved for 26 ft. in the western crosscut; it has cleavages running north and south, but the bedding planes would appear from the indistinct ripple markings to be nearly north-east and south-west. The country rock east of the ore-body has a slaty appearance, but is really the same as the western. The work done in this shaft might be taken to indicate that the ore-body is on a true fissure, but on the whole it is more likely to be simply a shear zone along the master jointing.

Some ore has been bagged from here, but the seconds at grass are very siliceous.



SECTION ALONG LINE OF LODE, DUCHESS.

The *No. 2 shaft* workings reveal a somewhat more promising state of affairs. The ore is reported to be 2 ft. 6 in. wide at the shaft bottom, but the water is heavy. In the southern drive the formation, except in the face, where it pinches to 2 ft., is 4 ft. wide, but there is little copper ore in it. The country rock here is slate, the strike of which appears but indistinctly to be across the lode. In the roof of the northern drive 12 in. of rich glance ore is visible, and in the floor 9 in. The ore becomes very ferruginous in the face, but the presence of decomposing pyritic ore is indicated by abundant efflorescent epsomite. The ore-body is bounded on the east by 12 in. of quartz, the country rock being schist striking across the lode.

About 40 tons of ore lie bagged at this shaft, with 20 tons fine-grained siliceous seconds (15%) and 15 tons unsorted ore (20%)—the chief copper mineral being malachite, though much glance is also present.

No. 1 shaft shows malachite and metallic glance across its whole width at the surface and the exposures on the 45 ft. level are even better. At the shaft there is only 18 in. of ore, but a few feet north of it the body opens out to the full width of the drive, and in the face of the northern drive 7 ft. of ore is visible, while the western wall has not yet been reached. The ore is earthy malachite, with some earthy cuprite and a little dense limonite. It probably will average 35% copper, but is becoming less pure towards the west. In the southern drive the eastern wall has been considerably slickensided vertically, but the ore-body is very irregular. Halfway along the drive, where the country is schist, the ore is only 6 in. wide, and beyond it for some feet there is only poor formation; but it then gradually increases to 6 ft. Near the southern face a horse (of decomposed sandstone ?) comes in from above, and in the face the ore-body is only 2 ft. 6 in. wide in the roof, and, containing 20% silica, is much more siliceous than usual, but in the floor it is 6 ft. wide. Bunches of chalcocite, both dull and metallic (glance), occur in the oxidised ore and also in the quartzite here.

About 30 tons of ore lie bagged at this shaft, and 50 tons of firsts have been paddocked.

ORE DEVELOPED.

Owing to the extremely irregular nature of the ore-body, it is not

GEOLOGY.

The shaft is in black micaceous schist, with bunches of calcite and bands of felspathic rock (altered sedimentary probably) just to the north of a crop of granular calcite a chain long and 6 ft. wide, changing southwards into yellowish limestone, with grains of quartz scattered through it. This limestone outcrop can be traced for 6 ch. to the south-south-west of the shaft in the direction of the general strike of the country, and it is therefore not the continuation of the Duchess lode. The latter has not been exposed within 10 ch. to the south, and in the intervening space may have been faulted or have pinched out altogether.

Duchess South (M.L. 323).

LOCATION, ETC.

This adjoins M.L. 275 (Duchess) on the south-west.

Its area is 10 ac.

It was understood that no work had been carried out on this lease, and it was therefore not inspected.

Ivanhoe (M.L. 277).

Mgr., Peberdy.

LOCATION, ETC.

The Ivanhoe lies ¼ mile west of the Duchess, on Burke River waters, 61 miles south-west of Cloncurry.

The area is 10 ac. This is the property of the Leichhardt-Cloncurry Development Syndicate.

LITERATURE.

For titles of reports numbered as below see Introduction.

(4) Mr. Cameron wrote:

> *Lease No.* 99 shows an outcrop of earthy ferruginous and cupriferous ore, associated with quartz, occurring along the bedding of altered sandstones and greywackes over a distance of about 70 yards, and over a breadth of perhaps 5 or 6 feet. Some portions look as if they might open up well, but no distinct outcrop of a lode can be observed.

(7) Mr. Rutherford states:

> "The copper staining is confined to patches of limestone and to some prominent boulders of jasper. The property seems to me of little promise."

(12) Mr. Waller considers the Ivanhoe a lode, and says that—

> "Concentration of copper ore may be reasonably expected underneath the capping at and below the permanent water level. The prospects of discovering rich deposits are greatly strengthened by the success which has been attained at the Duchess Mine."

DEVELOPMENT.

At the time of my visit only a few potholes had been sunk, but preparations were being carried out to begin the sinking of a deep shaft near the northern end of the lease.

GEOLOGY.

There is here a pronounced crop, 12 ft. in greatest width and 4 ch. in length, of silicified limonite, in which can be seen some pure quartz and occasional bunches of poor copper ore. The latter consists of carbonates and reddish oxides (20% copper), and the largest bunch seen contained only a ton or two at most. The crop has a considerable extension, but owing to the limited time available and the absence of workings, the necessity to traverse much of it was not apparent. The crop agrees with the strike of the country, and in all probability represents a bed of impure limestone in which the calcium carbonate has been replaced by iron oxides and silica, and as such it is not expected to prove a great copper producer.

Wild McGregor (M.L. 481).

LOCATION, ETC.

The Wild MacGregor is 25 ch. south of the Duchess, which is 61 miles south-west of Cloncurry. The road to Devoncourt and Cloncurry crosses this lease.

The area is 10 ac.

The main shaft is 30 ft. deep, and there are besides several other insignificant openings.

GEOLOGY.

There is no defined outcrop here, the ore presumably occurring as bunches in decomposed slate. The ore bagged amounts to 5 tons.

Maude A. (M.L. 360).

Mgr., Alexander.

ORE-BODY.

The strike of the ore-body according to the surveyor's plan is north by west.

PILGRIM GROUP.

This group was not visited, as it was understood that no work was going on.

Pilgrim (M.L. 276).

Mgr., Kennedy.

LOCATION AND AREA.

The Pilgrim is 3 miles south-west of the Duchess.

The area is 10 ac. This is part of forfeited leases Nos. 55 and 98.

LITERATURE.

For titles of reports numbered as below see Introduction.

(4) Mr. Cameron's full report is as follows:—

Lease No. 98.—Indications of copper are found on this lease along a belt of limestone running north and south through the lease along its western boundary. The limestone belt, which has narrow bands of interbedded schists, is from 60 feet to 100 feet in breadth. It is coarse-grained, and has a distinct schistose structure, the calcite grains lying with their shorter axis at right angles to the stratification. Along this belt of limestone occur several prominent outcrops of a siliceous rock similar to that found in the Cloncurry and Hampden Lodes. They are as much as 10 to 20 feet across and up to 20 feet in height. They are not apparently ore-bearing. On the south-western side of the southernmost of these, however, a little glance and carbonate ore is exposed; but it is almost entirely covered with soil, and its extent cannot even be guessed at. About 20 chains from the north end of the lease on the line of the siliceous outcrops is an outcrop of copper ore—glance and carbonate—apparently about 20 feet through. A sample from here assayed 27·1 per cent. of copper, a trace of gold, and 6 oz. 15 dwt. 22 gr. of silver per ton. This outcrop is well worth systematic prospecting. Its continuation is obscured by surface accumulations and it is possibly rich for some distance further north.

Lease No. 55.—The copper indications on this lease occur in a steeply-inclined bed of limestone some 30 feet in width, and outcropping for a distance of about 70 yards, in places to a height of 10 feet above the ground. The copper occurs as little blebs of carbonate scattered throughout the limestone. A sample taken from across the most likely-looking portion of the outcrop gave 3·8 per cent. of copper. This is, if anything, probably a little higher than the average, as in chipping off pieces for a bulk assay it is difficult to avoid turning one's attention more particularly to points where ore occurs.

Further to the south the limestone has apparently been replaced by quartz in a line continuous with its outcrop. The quartz can be traced for about 30 feet, and is copper-bearing for about 3 feet in width. The ore is glance and tile ore, and two assays of ore picked from the surface gave 14·5 per cent. of copper and 26·125 per cent. of copper respectively. This lode shows every appearance of being worth opening up over this latter portion.

Mr. Rutherford speaks of:

A siliceous limestone belt which is impregnated with copper carbonate, the result of decomposition of glance, which occurs in pisolitic form in the rock, Beyond the limestone to the south are contorted hills of weathered sandstone showing bedding places and stained with copper in places. It was probably from this overlying rock that the copper in the limestone was derived.

Pilgrim Extended (M.L. 485).

Mgr., Kennedy.

LOCATION, ETC.

This adjoins the Pilgrim.

Its area is 30 ac.

Empress (M.L. 610).

Mgr., Need.

LOCATION, ETC.

The Empress is understood to adjoin the Pilgrim.

Its area is 10 ac.

TRIKELANA GROUP.

Very little had been heard of the Trikelana at the time of my visit to the southern part of the field, and the group was therefore missed—unfortunately, to judge by latest accounts.

Trikelana (M.L. No. 522).

LOCATION AND AREA.

The Trikelana lies on Pilgrim Creek waters, 9 miles south of the Duchess, which is 61 miles south-west of Cloncurry.

The area is 10 ac. This lease was not inspected.

DEVELOPMENT.

A shaft had been sunk 39 ft. in Oct., 1906. It is understood that an open cut, 87 ft. long, 10 ft. wide and 6 ft. deep, has now been opened.

OUTPUT.

1906 ... 6 tons shipped.

Legacy (M.L. 658).

Mgr., Allis.

LOCATION, ETC.

The Legacy lies north-west of the Trikelana.

Its area is 10 ac.

MOUNT BIRNIE GROUP.

The group lies 74½ miles south-south-west of Cloncurry. It was not visited as practically nothing had been heard of it at the end of last year.

Mount Birnie (M.L. 686, Etc.).

Mgr., McLeod.

The Mount Birnie leases lie within ½ mile to the west of Mount Birnie itself. They are connected by road both with Cloncurry and with Boulia.

AREA.

Mineral leases Nos. 686, 742 (No. 2), 743 (No. 3), and 744 (No. 4), are each 10 ac. in area. Three other 10 ac. leases, and one of 15 ac. have been taken up round these.

DEVELOPMENT.

Mr. McLeod has shown me a plan of the workings, complete to June, 1907. This shows, on M.L. 686, a trench 20 ft. long and 10 ft. deep, and four shafts—No. 1, 50 ft. deep, with a 15-ft. crosscut to the east at 45 ft. depth; No. 2, 15 ft. deep; No. 3, 10 ft. deep; and No. 4, 6 ft. deep. On the lease to the west two shallow shafts have been sunk; on that to the south-east is another; and on the eastermost lease is another.

ORE-BODIES.

The main ore-body on M.L. 686 is believed to strike north by east. The trench on it is understood to be wholly in ore-bearing country, there being a cupriferous and ferruginous blow to the north, 15 ft. wide, rich in cuprite over a width of 4 ft. The main shaft on the western side of the blow was sunk to water level (about 65 ft. below the surface). Numerous assays, showing high copper content, have been made of material from the shaft, but most of the specimens were probably taken from rich seams of ore. No. 2 shaft on the main line of strike has also yielded rich stone, including dense glance stained by malachite. At least six other outcrops, running in various directions, have been located on the leases.

Monastery (M.L. 467).

LOCATION AND AREA.

The Monastery lies 5 miles west of the Mount Birnie and 18 miles south of the Duchess, which is 61 miles south-west of Cloncurry.

The area is 10 ac. This lease was not visited.

DEVELOPMENT.

Open cuts are said to be almost continuous over a length of 150 ft., the most northerly being 9 ft. long, 4 ft. wide, and 12 ft. deep.

OUTPUT.

1906	6 tons shipped.	
... ...	6 ,, ,,	containing 30% copper.

ORE.

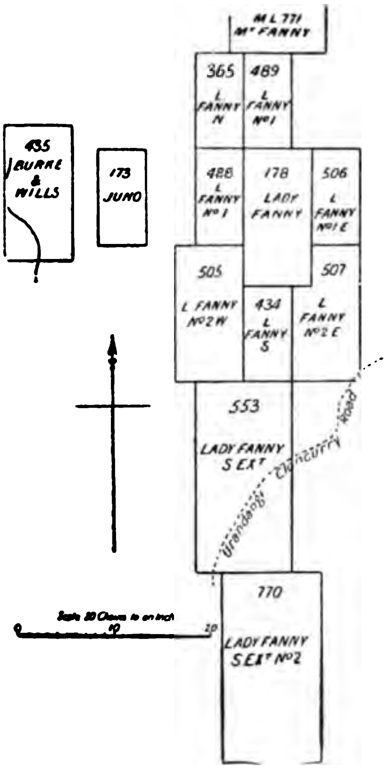
The ore is glance and malachite uniformly high in grade, and it was reported that 50 tons of 20% ore were paddocked early in the year.

WILLS RIVER.

he Mount Hope Group is included under this heading, because usual practice, but the mines are really within the Burke River ient area.

LADY FANNY GROUP.

he Lady Fanny group, which is 60 miles south-west of Cloncurry, ises, besides a number of leases adjacent to the original, the , Prodigal, Blue Spec, Chum Victoria, Burke and Wills, etc.



LADY FANNY GROUP.

ıe Lady Fanny porphyries are similar to, but in much greater ıan, those at the Dobbyn-Boundary Group. The association of ores, especially chalcocite, and porphyries is to be noted in tion with the discoveries at Ely, Nev., where immense bodies containing 2 to 2½% copper are to be worked in the near future.

Lady Fanny (M.L. 178).

LOCATION.

The Lady Fanny is located near the head of a small tributary of the Wills River a quarter of a mile west of the main Urandangi road at a point 60 miles south-west of Cloncurry, and 4½ miles north-east of Teddington Lock station, on the Wills River. The distance by road from Cloncurry, taking the New Bridgewater short cut, is 77 miles.

AREA.

The area is 10 ac.

It is reported that a Melbourne syndicate had secured a 6 months' option in January last, but at the time of my inspection there was no one on the ground.

DEVELOPMENT.

The workings comprise three trenches; one shallow hole, and two shafts.

Two of the trenches are on the southern end of the main outcrop, the third on a separate crop two chains to the west. The shallow hole is on the eastern side of the main outcrop.

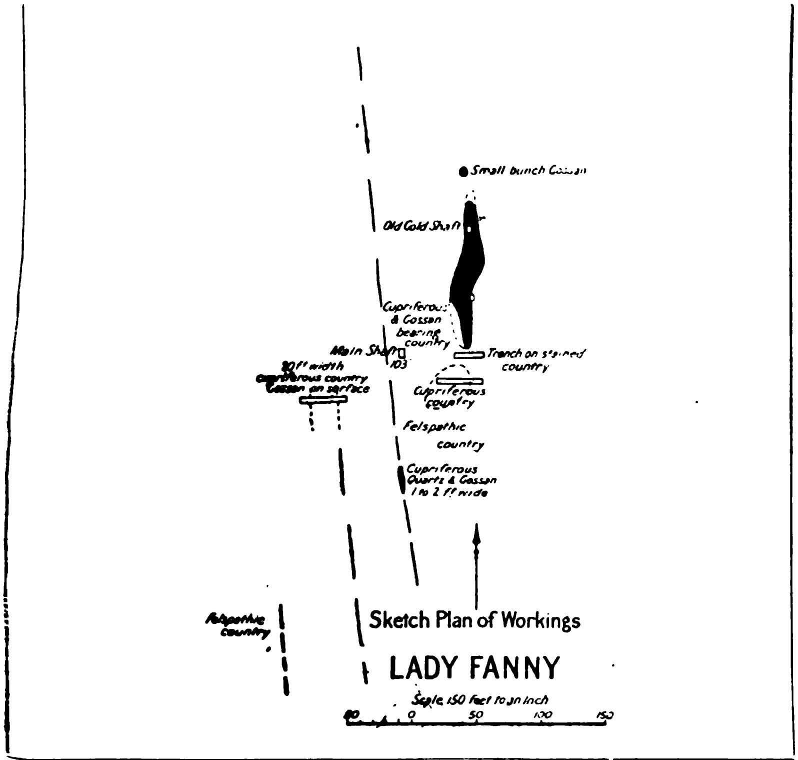
The old gold shaft was sunk in 1900, and is reported to be 60 ft. deep.

The new shaft, 50 ft. west of the main crop, is 103 ft. deep. It was inaccessible to me, but it is known that at the 100 ft. level there are crosscuts east and west, their total length being 100 ft.

OUTPUT.

1905 ... 10 tons.

surface. It ends more abruptly on the south, the trench there exposing only slightly stained country. Just beyond this, however, the country over a width of 30 ft. is veined with green carbonate, and carries bunches of gossan, but there is no further sign of a massive ore body. The gossan would therefore seem to be the outcrop of a big bunch or shoot.



Sketch Plan of Workings

LADY FANNY

Small bunch Gossan
Old Gold Shaft
Cupriferous & Gossan bearing country
Main Shaft
103
Trench on stained country
30 ft width Cupriferous country Gossan on surface
Cupriferous country
Felspathic country
Cupriferous Quartz & Gossan 1 to 2 ft wide
Felspathic country
Scale 150 feet to an inch
50
0
50
100
150

The hole sunk on the eastern side shows the ore to be not well defined from the kaolinised country to the east, into which irregular bunches project. About 17 tons of ore, assaying 27·75% copper, have been shipped from this hole. The 10 tons of ore at grass, consisting of gossan with malachite and tile ore, will probably run 20% copper.

The old shaft was sunk for gold, specks of which could be seen in the ore, but the highest yield reported was only 13 dwt. per ton. The material of the tip comprises soft gossan. This shows no copper, but copper will most certainly be found beneath it, and the shaft should therefore be deepened.

The main shaft, sunk to test the ore at a depth, instead of being in the ore-body—underlying if necessary—is in the hanging-wall country to the south-west. Very encouraging reports appeared while the work of sinking and cross cutting was in progress; sulphides were first met at 65 ft. depth, and at the shaft bottom the body was said to be 12 ft. wide and to assay, with that in the shaft, 25% copper: but there is no evidence of any quantity of ore having been raised from the shaft. The rock on the tip is bluish chloritic schistose slate, in which chalcopyrite occasionally occurs disseminated and more often as veins. Interesting changes have taken place in the country rock where it has become impregnated with chalcopyrite, the chief of which has been the production of crystalline hornblende. This occurrence is perhaps analagous to that at Rossland, B.C.,* where the deposits are considered to have been formed under dynamic metamorphic conditions. The amount of cupriferous country visible is only a few tons, but there may be more buried in the tip. The surface indications—the trench shows only stained country—are not favourable for success in cross cutting at this particular spot, but veins of chalcopyrite do seem to have been cut, and now these might be followed to the north to strike the main ore-body.

ch. south of the main shaft, there is a crop of quartz and gossan obably 2 ft. wide, on which, however, no work has been done. The ıthern part of the belt is well worth a thorough prospecting; but, the north western corner of the lease, conditions for the developınt of large bodies do not appear to have been so favourable, the ɜ bunches being comparatively small and the intervening country ceedingly hard and undecomposed. Though a few tons may be got ɪm the surface, this part of the belt is not likely to be ever mined a whole.

Lady Fanny North (M.L. 365).

LOCATION AND AREA.

This lease lies north-west of the Lady Fanny, adjoining it only at e south-eastern corner.

The area is 5 ac. The lease was unmanned when seen by me.

DEVELOPMENT.

The workings, which are at the southern end of the lease, 90 ft. ove the Lady Fanny brace, comprise two potholes 2 ch. apart, one which, the southern, is 10 ft. square and 10 ft. deep.

OUTPUT.

4 tons shipped containing ... ... 20% to 30% copper.
1906 5½ ,,

ORE-BODIES.

At the northern hole only copper-bearing country rock is visible, t at the southern hole can be seen 9 in. of gossany material on the st and 18 in. of similar stuff on the east of 8 ft. of kaolinised rphyry. The ore can be traced on the surface for ½ ch. north of the ʒ hole and 1 ch. south, where there is 3 ft. width of gossany country d quartz containing say 10% copper.

The seconds at grass, about 5 tons weight, consist of blue and een carbonate in siliceous gossan, and contain 10% copper.

GEOLOGY.

These bodies probably simply fill cracks of limited extent. The untry is hard schistose porphyry, and though the separate bodies ve no sign of permanance the possibility of the porphyries being ıiformly cupriferous at a depth is not to be overlooked.

Lady Fanny North No. 1 (M.L. 489).

LOCATION, ETC.

This adjoins the Lady Fanny on the north.

The area is 5 ac. The mine was idle when inspected in January.

Only one hole, 10 ft., has been opened, and that is in the southestern corner.

ORE-BODY.

The ore-body can be traced southwards for nearly a chain into ıe Lady Fanny. In the hole it is 2 ft. 6 in. wide—the usual oxidised gossany ore, rather siliceous but containing at least 20% copper. The felspathic country rock is much kaolinised, and, as in the Lady Fanny North, may prove evenly cupriferous at a depth.

Unnamed (M.C.).

LOCATION, ETC.

This lies 1 m. north of the Lady Fanny. It was not visited by me.

There is a 10-ft. open cut (May, 1907).

ORE-BODIES.

There is reported to be a formation, 1 to 2 ft. wide, of copper ore (oxidising pyrite) and crystalline hæmatite. Gold occurs in paint and sheet form on the faces of the crystals of hæmatite, having probably been leached from the adjacent copper ore and reprecipitated there.

Lady Fanny West (M.L. 488).

LOCATION, ETC.

This adjoins the Lady Fanny on the west.

The area is 5 ac. The lease was idle at time of visit in January of this year.

The only opening is in the north-eastern corner of the lease; it is 10 ft. deep.

ORE-BODY.

The hole is on a body 9 to 18 in. wide of malachite-bearing tile ore in felspathic country, kaolinised near the lode. The ore cuts out a few feet south of the hole, but shows for half a chain to the north-east, in which direction it becomes very siliceous. No large amount of ore is likely to be found here.

Juno (M.L. 773).

LOCATION.

The Juno is 10 ch. west of the Lady Fanny.

Its area is 5 ac. Not visited.

Burke and Wills (M.L. 435).

out, is 15 ft. deep. A vertical shaft, 10 ft. to the east of the shaft in the cut, is 15 ft. deep, and the other, 10 ft. to the south of it, is 46 ft. deep (inaccessible). The fourth shaft, which is shallow, lies 10 ft. east of the second.

OUTPUT.

1906 ... ... $37\frac{15}{20}$ tons shipped.

ORE-BODY.

The formation in the open cut averages 5 to 6 ft. in width. It consists of calcareous kaolinised rock stained with malachite throughout and containing bunches of gossan, with veins of acicular malachite and patches of tile ore. The ore-body was reported to be 3 ft. wide in the cut and 18 in. wide in the central shaft. The body probably does not extend beyond the limits of the open cut, but the alluvium of the flat precludes certainty on that point.

The firsts (30% copper) at grass amount to 2 tons, and consist of quartz-bearing limonite, with chalcopyrite altering into glance and veined by radiating malachite. The seconds, about 10 tons, consist of gossan with malachite, and probably will run 15% copper.

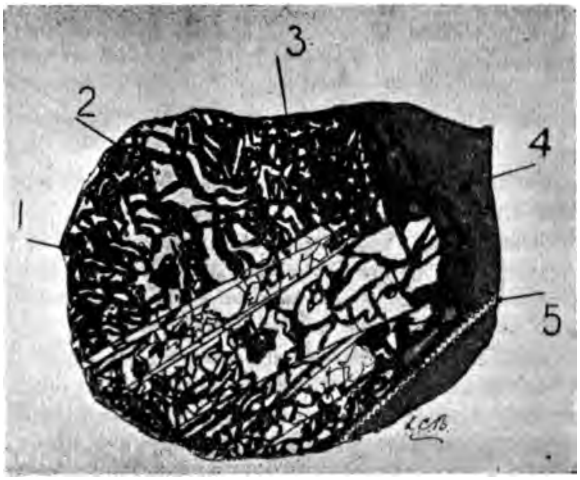


FIG. 2 (DOUBLE NATURAL SIZE).—CHALCOPYRITE ALTERING INTO CHALCOCITE AND LIMONITE, ITALIAN.

1. Chalcocite. *4. Limonite, with very little chalcocite.*
2. Unaltered chalcopyrite. *5. Malachite (vein).*
3. Chalcocite, with a little unaltered chalcopyrite.

The country rock, where visible north, south, and west, is porphyry, but to the east there is schist.

The southern shaft is in softened chloritic schist, and some glance and earthy secondary sulphide ore containing native copper has been raised from it.

Blue Spec (M.L. 368).

Gairns.

LOCATION, ETC.

The Blue Spec is 1¼ mile south-south-east of the Italian.

Its area is 5 ac. Not visited.

ORE-BODY.

The survey plan shows an outcrop striking north-west and south-east.

Blue Light (M.L. 703).

LOCATION, ETC.

The Blue Light is ½ mile north of Blue Spec

Its area is 5 ac. Not visited.

Lady Don (M.L. 702).

LOCATION, ETC.

The Lady Don is ¼ m. west of Blue Spec.

Its area is 10 ac. Not visited.

Prodigal (M.L. 490).

Mgr., Riordan.

LOCATION, ETC.

The Prodigal lies 2½ miles south-south-east of the Lady Fanny.

The area is 5 ac.

There is one shaft 35 ft. deep, and an open cut running 12 ft. south of the shaft.

OUTPUT.

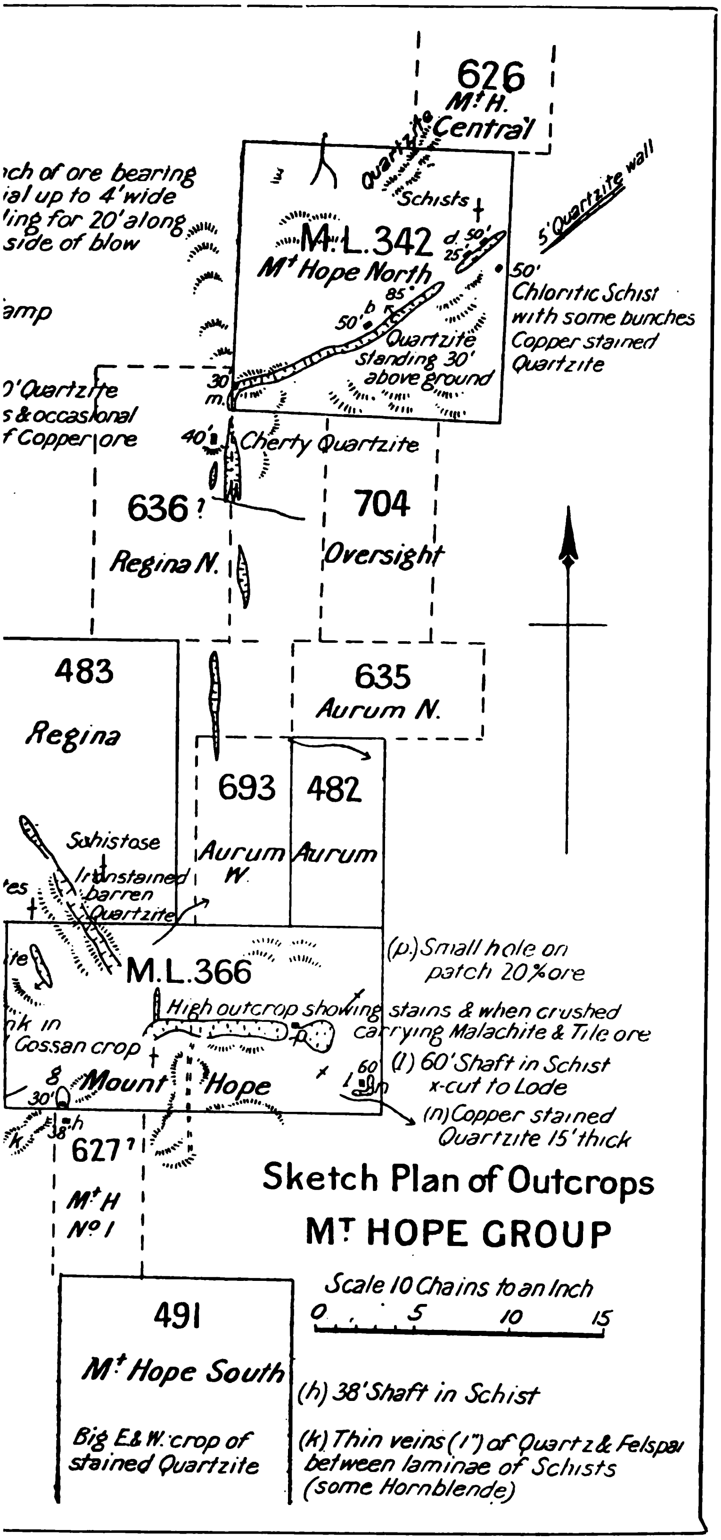
1906—16 tons shipped, containing ... ... 23% copper.

ORE-BODIES.

The ore here forms a very irregular body between porphyry, which, near the lode, has been rendered micaceous, and quartzite

MOUNT HOPE GROUPS.

group proper, 53½ miles south-west of Cloncurry, comprises Mount Hope, Regina, Aurum, and numbers, but the Little and others in the vicinity are included here for convenience.



626
Mt H. Central
Quartzite
Schists
M.L.342
Mt Hope North
d 50'
25'
5' Quartzite wall
50'
Chloritic Schist with some bunches Copper stained Quartzite
85°
b
50'
Quartzite standing 30' above ground
30
m.
ch of ore bearing ial up to 4' wide ing for 20' along side of blow
amp
0' Quartzite s & occasional f Copper ore
40'
Cherty Quartzite
636?
Regina N.
704
Oversight
483
Regina
635
Aurum N.
693
Aurum W.
482
Aurum
Schistose
Ironstained barren Quartzite
es
te
M.L.366
High outcrop showing stains & when crushed carrying Malachite & Tile ore
nk in Gossan crop
Mount Hope
8
30'
g
p
60
l
(p) Small hole on patch 20% ore
(l) 60' Shaft in Schist x-cut to Lode
(n) Copper stained Quartzite 15' thick
k
38
h
627?
Mt H No 1
491
Mt Hope South
Big E & W crop of stained Quartzite
Sketch Plan of Outcrops
Mt HOPE GROUP
Scale 10 Chains to an Inch
0 5 10 15
(h) 38' Shaft in Schist
(k) Thin veins (1") of Quartz & Felspar between laminae of Schists (some Hornblende)

The immense quartz blows of Mount Hope are not quite duplicated in any other part of the field, and the locality is also distinguished by the presence of aplite dykes or veins, evidence of expiring deep-seated igneous activities.

Mount Hope (M.L. 366).

Mgr., Pasley.

LOCATION, ETC.

Mount Hope is located on one of the head branches of Green's Creek, a tributary of the Burke River, 53½ miles south-west of Cloncurry.

The area is 20 ac. This lease was deserted when inspected.

DEVELOPMENT.

The workings comprise two inaccessible shafts and a pothole. One of the shafts, 30 ft. deep, is on the southern boundary near the south-western corner of the lease; the other, 60 ft. deep, is in the south-eastern corner, and from it a crosscut runs south. The state of the workings did not allow of my making an underground inspection.

OUTPUT.

1906 ... ... $10\frac{18}{20}$ tons shipped.

ORE-BODIES.

Very little copper ore can be seen at the surface in this lease, but there are five prominent quartz and quartzite outcrops.

One, quite barren, in the north-western corner, is three chains long and several feet wide. It strikes north-west, dipping to the south-west across country striking north and south.

The second crop, 4 ch. to the east, is a prominent wall of barren t a depth. The rock on the tip is dark chloritic schist, some of it tained by copper carbonate, but though good ore was said to have een obtained, little can be seen on the surface. The strike of the ountry is here north-east.

Another more promising crop of silicified gossan, 40 ft. in length nd 15 ft. wide, is to be seen in the south-western corner of the lease, 'here the 30 ft. shaft has been sunk. The ore from the shaft bottom -dense gossan with carbonate stains—is not unpromising, but the reater part of the sinking was in very siliceous ore, and much of the ip is ironstained quartzite. About 15 tons of 5% ore have been addocked.

GEOLOGY.

The occurrence of pegmatite—quartz and orthoclase (exhibiting a rong parting and a slight schiller structure), with occasional hornlende—as thin veins between the laminæ of the schists at the southestern corner of the lease, as well as over much of the country to the rth-east, is interesting and important in considering the genesis of e quartz bodies. Pegmatites are the after result of igneous intruon, the minerals having been given off pneumatolitically from the oling magma, and it has been shown* in other parts of the world at pegmatites shade insensibly into quartz veins carrying copper inerals. It is therefore extremely probable that the Mount Hope artzites are of deep seated origin.

Mount Hope North (M.L. 342).

LOCATION, ETC.

The lease is situated ½ mile north of the Mount Hope lease.

The area is 20 ac. This ground was deserted in January, but r. Burns, manager of the adjoining lease, conducted me over it.

DEVELOPMENT.

The prospecting of this lease was done during 1905 and 1906 by e Hampden Company, who, when holding an option over the proerty, sank 5 shafts. No. 1 shaft, in the south-western corner, is) ft. deep; No. 2 shaft, 8 ch. to the north-east, is 50 ft. deep; No. 3 aft, 6½ ch. north-east of No. 2, is 25 ft. deep; No. 4 shaft, 1 ch. eyond No. 3, is 50 ft. deep; and No. 5 shaft, 1½ ch. south-east of o. 4 and adjacent to the eastern boundary, is 50 ft. deep, and has rives 50 ft. to the south and 50 ft. to the north.

OUTPUT. (Warden's reports.)

Dec., '05—20 tons raised	40% copper
Mar., '06—40 ,, ...	?
May, '06— 5 ,, bagged.	

ORE-BODY.

The outcrop tested by four of the above shafts strikes north-easty-east across the lease from the south-western corner, where it makes a sharp bend and runs south. It consists of dense white quartzite up to 30 ft. thick, and standing in places 30 ft. above the ground. The quartzite carries only traces of copper, the stains being mostly on the surface.

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* The Rôle of the Igneous Rocks in the Formation of Veins. By J. F. Kemp. m. Inst. Min. Eng., Richmond meeting, Feb., '01.

In shaft No. 1, on the western side of the crop, no ore was found, though a few yards to the south the quartzite carries stains and occasional bunches of ferruginous ore over a width of 30 ft.

Shaft No. 2 is on the hanging-wall side of the quartzite, and nothing more than stains of malachite in ferruginous quartzite was found.

At shaft No. 3 a bunch of ore-bearing material, up to 4 ft. wide, extends along the northern face of the quartzite for 30 ft., but only ironstained quartzite seems to have been raised. These workings have thus proved nothing of value, and there is no surface indication of any quantity of copper ore here.

No. 5 shaft was sunk to prove a parallel crop of quartzite to the south-east of the main one. The rock on the tip is chloritic schist, with some bunches of copper-stained quartzite and a little chalcedonic quartz, distributed through which cuprite occurs irregularly scattered, surrounded by a staining of malachite. It is understood that 12 tons of 23% ore was despatched from here. This is the only place on the ground from which any shipping ore has been obtained.

Regina North (M.L. 636).

Mgr., Burns.

LOCATION, ETC.

This lease adjoins Mount Hope North at the south-western corner.

The area is 10 ac. This lease had not been surveyed when inspected. It is the property of a Melbourne syndicate.

DEVELOPMENT.

The only work in progress was the sinking of a shaft 50 ft. west of the Mount Hope quartzite crop in the north-eastern corner of the lease. It was then 40 ft. deep. The sinking of this shaft and that on the Mount Hope No. 1 was the only work then going on in the Mount Hope Group.

ORE-BODY.

The Mount Hope North quartzite bends and runs south in this lease. At the south-western corner of the northern lease it is slightly cupriferous, but in this is quite barren. The crop, which is rather cherty in parts, frays out about 5 ch. south of the Mount Hope North, but several other isolated crops appear on the line of strike to the south. The shaft is being sunk 50 ft. distant to the west of the crop, to catch the quartzite on the underlie, but at 40 ft. depth was still in schist. There appears to be no justification for sinking here.

Regina (M.L. 483).

Mgr., Burns.

LOCATION, ETC.

It adjoins Mount Hope on the north, at the western end.

Its area is 15 ac.

There are no workings.

ORE-BODY.

A large body of barren iron-stained quartzite enters the lease at the southern end. Its strike is north-west, while that of the country is definitely north and south.

Aurum (M.L. 482).

Location, Etc.

It adjoins Mount Hope on the north, at the eastern end.

Its area is 5 ac.

No work has been done.

Ore-bodies.

None. The country is silicified slate.

Mount Hope No. 1 (M.L. 627).

Location, Etc.

This adjoins Mount Hope on the south.

The area is 5 ac.

One shaft near the northern boundary 38 ft. deep, in process of sinking in January, 1907.

Ore-body.

There is no crop here, the shaft being sunk in search of that cropping in the south-western corner of the Mount Hope, but there is no justification for the work.

Mount Hope South (M.L. 491).

Location, Etc.

This lease is 10 ch. south of the Mount Hope.

The area is 30 ac. The lease, being deserted, was not inspected.

There are no workings.

ORE-BODIES.

At the southern end there is little outcrop, but at the northern end 18 in. calcite can be seen, and beyond the northern potholes cupriferous limonite boulders are scattered over the surface for a distance of a chain.

The southern shaft being ladderless, a descent could not be made. The country is black chloritic schist, in which the ore probably occurs in bunches. The firsts at grass, 5 tons, consist of chalcopyrite, with infilled chalcocite, free from quartz and likely to yield 40% copper. The seconds, amounting to 5 tons, consist chiefly of limonite with veinings and infillings of carbonates and traces of silicate, and will run 15% copper. The tip, as a whole, may be expected to carry 5% copper. A specimen of pyrite, said to have come from the bottom of the shaft, was shown me. It bore signs of having suffered leaching, and was said to have been directly overlain by glance and covellite (?).

The pit to the north-east presumably was opened on a bunch, for schists only are now visible in the hole. There is about 1 ton of 10% ore at grass.

At the central shaft about 10 tons of 20% ore lies at grass. This is gossany limonite, with stains and impregnations of malachite, some tile ore, and a fair quantity of chalcopyrite, as usual partly converted into chalcocite and limonite and tesselated in appearance.

In the northern potholes only boulders of cupriferous limonite were found.

There is thus no evidence of any large quantity of ore on this claim, but it must be remembered that most of the surface is covered by quartz and silicified schist gravel, which hides the softer rock.

Blue Jacket (M.L. 632).

LOCATION, ETC.

The Blue Jacket lies about 3 miles east of Mount Hope, among lowlying rounded, rolling but stony ridges.

The area is 5 ac.

DEVELOPMENT.

The shaft, 15 ft. deep, is located centrally in the eastern part of the lease; from it a stope has been carried northwards the full depth for 12 ft., and at the bottom a drive is being carried still further north. The only other work done here is a trench 3 ft. deep running 12 ft. north of the stope.

OUTPUT.

3½ tons shipped, containing ... ... 26½% copper.

ORE-BODY.

The north and south striking shoot of ore is believed to be pitching northwards from the shaft, in the southern end of which is exposed 4 ft. width of calcite, with bunches of quartz-bearing limonite. This crop can be traced for 10 ft. south of the shaft.

In the northern end of the stope also a well-defined formation, carrying calcspar, occurs, but the ore in the floor of the drive has pinched to 6 in. in thickness.

In the northern end of the trench no limestone is visible, but the ore is 12 to 18 in. wide, and here comprises high-grade glance and tesselated glance-chalcopyrite, with bunches of quartz and tile ore veined with atacamite.

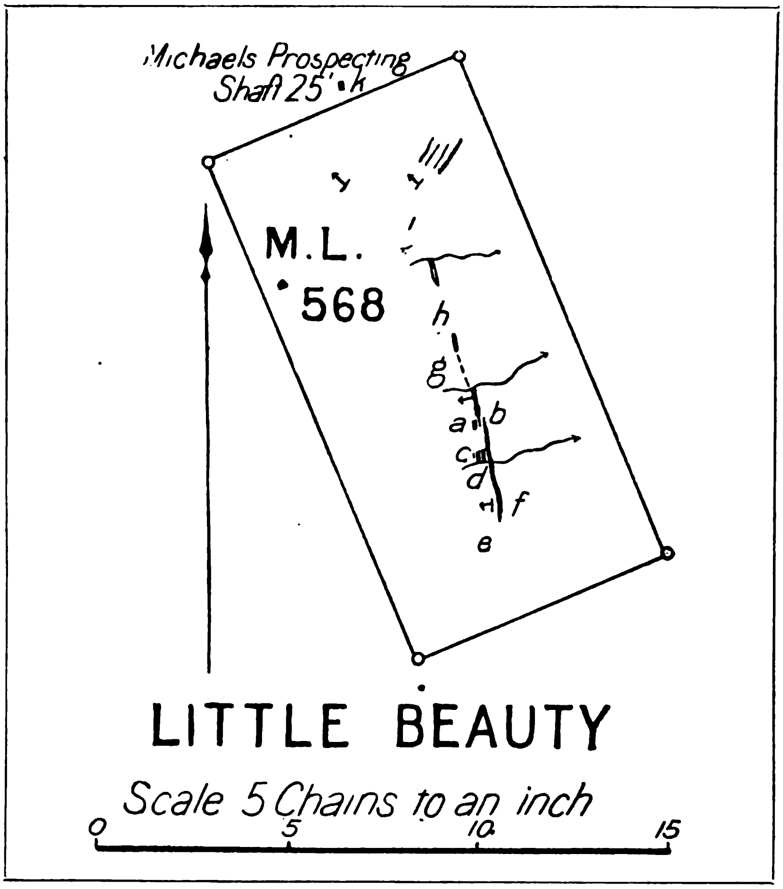
The ore at grass ready for bagging amounts to 3 tons. It consists in great part of dense glance and chalcopyrite with cuprite, radiating malachite and native copper in limonite stained with malachite. The association of native copper with calcium carbonate is to be noted as almost a general rule. One of the claim-holders showed me a sample of cuprite and native copper, which should yield over 80% copper, but the smelter's return for similar ore is alleged to have been only 26%, the reason given being that it should have been sent as matte. In addition to the above, there are 1½ ton bagged at the shaft and 7 bags of cuprite. The seconds, 6 tons, include limonite with malachite veins, impregnations and stains, and the heap ought to run over 15% copper. The 3½ tons of ore shipped from here yielded only 26½% copper, owing, some assert, to the inclusion of much barren ironstone.

The shaft is to be deepened, as, although the ore may be bunchy, the formation will go down. Still it must be acknowledged that no large output is to be expected.

GEOLOGY.

DEVELOPMENT.

The workings, which are in the central southern part of the lease, comprise only a trench 4 ft. deep and a shaft 50 ft. deep, with drives 10 ft. east-south-east and 12 ft. west-north-west.



OUTPUT.

1906 ... ... 2 tons shipped, containing 29% copper.

ORE-BODIES.

The ore-bearing zone extends in a north-north-westerly direction over a distance of 7 ch., having a width in one place of 30 ft. Bunches of ore occur through this zone, but it is very doubtful if they are numerous enough for the deposit, as a whole, to be payably worked under any circumstances.

Beginning at the southern end, the country is stained with carbonates over a width of 15 ft., and has some bunches of fairly rich limonite-chalcopyrite-chalcocite ore, in addition to thin veins of gossan and quartz. At the gutter, 1½ ch. from the southern extremity, the formation contracts to 10 ft., and over 5 ft. width of country is included in this, but from the gutter for 30 ft. to the north the country is copper-bearing over 30 ft. in width. This formation should be trenched across in two or three places.

A promising gossan crop is then met, which can be followed northwards for 1½ ch., being 3 ft. wide near the centre.

Half a chain from the northern end of this crop it is over-lapped by another on the west. This is an irregular body of gossan quartz and copper ore (limonite with chalcocite and stains of malachite) 1 to 2 ft. wide, and from the trench opened on it 2 tons of 29% ore were obtained. It runs for only 1 ch. to the second gutter, beyond which only small bunches of gossan show at the surface for 1 ch., and then larger bunches, up to a few hundredweight each, of 10% gossan for ½ ch.

The country is then nearly barren for a distance of 1 ch., to a 12 in. crop of gossan extending 1 ch. to the third gutter. The schists 15 ft. to the north-west of this crop are stained over a width of 3 ft.

For 2 ch. north of the third gutter the country is slightly cupriferous over areas 10 ft. long and 2 ft. across, and one small patch of a few hundredweight of very siliceous carbonate stained limonite has been broken into. No other indication of copper can be found to the northwards on the line of strike, but the country here seems to have

The country on the west at the southern end of the formation is altered gneiss and slate, with quartz lenses dipping 70° westwards; but further north silicified slates only are found; and, as mentioned, in the northern part of the lease, the strike changes to north-east. The country on the east is dark coloured gneiss. Aplite veins were noticed about a mile to the south-east of the Little Beauty. The rock is of somewhat striking composition, small crystals of pink orthoclase being scattered irregularly, and not very frequently, through a ground mass of quartz exhibiting a very distinct and unusual lamellar structure somewhat resembling the multiple turning of plagioclase.

The ore at grass not yet sorted, amounting to 3 tons, consists of tesselated ore (chalcopyrite altering into chalcocite) and malachite stained limonite almost free from quartz (that which is present being crystallised in cavities). It should average 20%, but probably 2 tons of 30% ore could be picked from it. The 10 tons of formation piled near the brace may carry 2% copper.

Mount Beauty (M.L. 705).

Location, Etc.

The Mount Beauty lies ½ mile east of the Little Beauty.

Its area is 5 ac.

No work has yet been done.

Ardath (M.L. 656).

Location, Etc.

The Ardath lies between Green's Creek and the Urandangi road, ½ mile west of Smith's store and 4 miles south-east of Mount Hope.

The area is 10 ac. Exempt when visited.

Development.

The main shaft near the centre of the lease is 52 ft. deep (inaccessible), and another near the southern boundary is 20 ft. deep. Besides these there are four potholes 1½ ch. south of the main shaft and 1 ch. south-east of the southern shaft.

Output.

3 tons shipped (report).

Ore-bodies.

A crop of quartz and quartzite, striking north-east, comes into the lease from the south-west and peters out near the centre. The country for a chain to the south-east of this crop is much kaolinised, and carries bunches of good ore, over a length of 5 chains. The bunches are not, however, frequent enough for the whole belt to be mined nor large enough to warrant mining on a large scale for themselves.

The main shaft is sunk in kaolinised schist (stained bright yellow perhaps by traces of vanadium salts) containing 1 or 2% copper disseminated as carbonate with very occasional nodules of ore—malachite, chrysocolla and covellite (?), with inclusions of unaltered chalcopyrite reticulated with bluish chalcedony, probably introduced subsequently to the commencement of oxidation and tesselation of the chalcopyrite. A few hundredweight of earthy glance was got near the shaft bottom, and the proposal to continue sinking is sound, as much copper may have been leached downwards from the surface country.

The southern shaft proved 4 ft. in width of chloritic schist, stained and replaced by malachite and containing bunches of gossan and chalcopyrite altering into glance. It is reported that 3 tons of ore has been shipped from here; the 10 tons seconds at grass, cupriferous kaolinised country, probably average 5% copper.

In the pothole to the south-east of this shaft a width of from 1 to 5 ft. of kaolinised country is copper bearing. Some gossan was raised from here, but it is very siliceous.

At the pothole to the south of the main shaft there are several small gossan crops, and the holes, which went down in calcareous kaolinised country, struck occasional bunches of gossan carrying malachite and chrysocolla, sometimes with a little pyrite.

HAMPDEN.

LOCATION.

The township of Hampden, which has an elevation of 1,200 ft. above sea level, is situated 40 miles due south of Cloncurry and 50 miles west of Mackinlay, the distances by road being 50 miles and 60 miles respectively. The Mackinlay road is very seldom used because of its crossing a rather abrupt range. Under this heading are included the Hampden Group and mines in its vicinity and the Monitor Group.

HAMPDEN GROUP.

The Hampden deposits are quite differentiated from most others in the Cloncurry district, by being stockworks primarily and also by their association with diorite.*

Hampden (M.Ls. 244, 245, Etc.).

(Mgr., C. L. Smith.)

LOCATION.

The main workings are located within ½ mile to the north of the township.

AREA.

The company (known as the Hampden-Cloncurry Copper Mines, Ltd.) holds a total of 260 ac.— viz., as adjacent leases: M.L. 244 of 20 ac. (part of Block 37); M.L. 245 of 20 ac. (part of Block 38); M.L. 405 of 20 ac. (now known as Block 38 east); M.L. 406 of 20 ac. (now known as Block 37 east); M.L. 408 of 80 ac. (known as the Hampden North); and M.L. 407 of 80 ac.

Most of the mining has been done on the first two, though some prospecting has been carried out on the Hampden North. M.Ls. 405 and 406 are held as works sites. For fluxes—limestone and ironstone—two leases have been taken up—viz., M.L. 421 of 10 ac. and M.L. 422 of 10 ac. (known as Mount Sylvia).

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* Mr. Hartwell Conder, A.R.S.M., of Melbourne, has lately sent me some thin sections of specimens collected by him in the Cloncurry district. Examination of these with the microscope proves that certain rocks, resembling highly altered sedimentaries, found on the Argylla and Great Australia freeholds, are diorites, and the occurrence of that rock, altered to a greater or less extent, is, perhaps, much more widespread than was thought by me. Mr. Condor is now trying to trace the change from diorite to schist. Close study of limited areas may be expected to have some interesting results, among them being the proving that the copper has been derived from the diorite. The only hindrance to this work is the scarcity of outcrops of the country rock in the vicinity of the ore bodies.

TOPOGRAPHY.

The Hampden Mines lie in a wide flat-bottomed valley of mature age, there being on the east only remnants, such as Mount Sylvia, of the old Cloncurry pene-plain, though more extensive ranges are found to the north-west. Gidia and stunted gum are the only timbers and they are not abundant.

HISTORY.

In 1884 Mr. Warden Uhr marked out two mineral leases, called Eureka, which would appear to have been on the Hampden crops.

The first official mention of the Hampden Mine is found in a report by Mr. W. W. Alder, for 1898, in which year a Melbourne syndicate began prospecting operations under the management of Mr. Godkin. Two shafts were sunk, 40 and 50 ft., and 20 trenches opened. Ten tons of ore were shipped and 100 tons stacked. Much prospecting was done in 1899, and the ore raised from the open cuts was graded.

Work in the open cuts was continued during 1900, though it was not possible to ship the ore raised, because of the drought. Early in 1901 work ceased, owing to continuation of the drought, but was resumed towards the end of the year, only to be again thrown over on the failure of the wet season in 1902.

Operations were not again undertaken, owing to the low market value of copper, till 1904, when contracts were carried out in shaft No. 12, after which a six months' tribute (No. 1) was given to Entriken

4. In his description, Mr. Cameron says "The Hampden Lode then appears to be a belt of vertical slates impregnated with cupriferous pyrites. Above the water-level the pyrites has been decomposed, and the copper concentrated into irregular masses by solution and redeposition from percolating water."

6. Mr. F. Stanley Low describes the workings in some detail, and mentions that the ore at grass comprised:

625 tons,	1sts	40%
2,691 „	2nds	13%
2,276 „	3rds	6½%

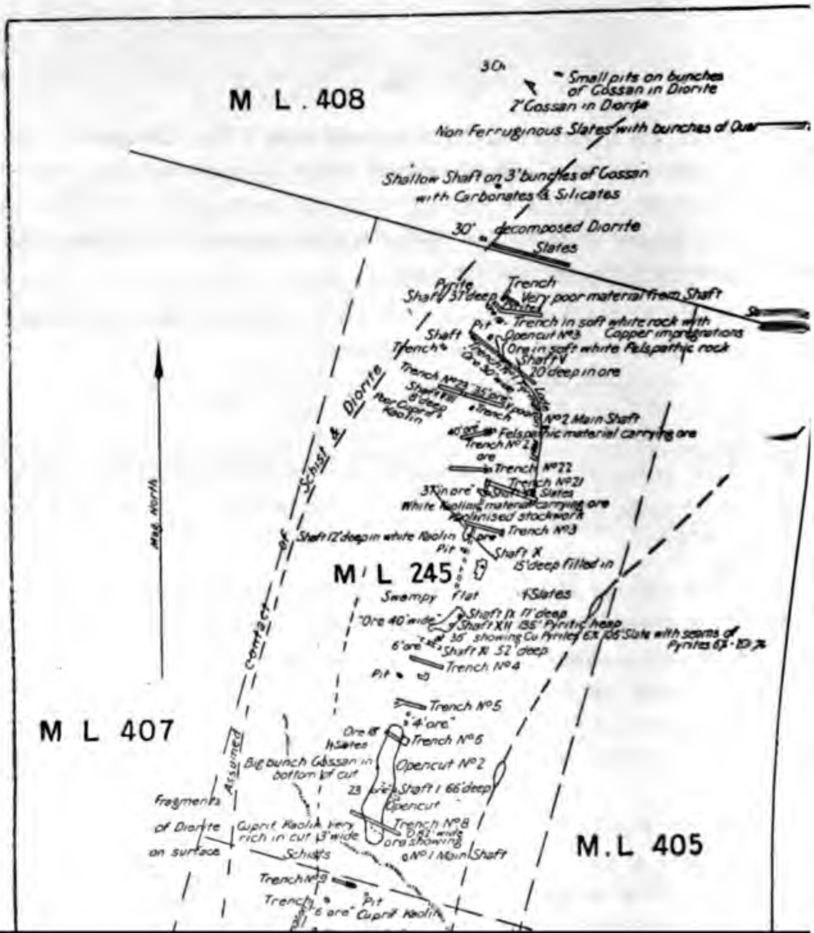
Mr. Low estimates the ore available for extraction as 116,000 tons, of an average grade of 15% copper, containing a gross value of £1,260,000.

8. A number of analyses, given in this report, are quoted below. Mr. Gibb goes into some detail as to the smelting qualities of the Hampden ores, showing that they require from 25% to 75% iron ore and limestone for fluxing, while the pyritic slate from No. 12 shaft would require no flux, "but on the contrary, if this ore were proved to exist in sufficiently large proportion, it would, by the production of iron oxide in smelting, provide flux for the ore containing silica in excess, now rejected, and so reduce the cost of smelting the latter. . . . In the case of pyritic slate, represented by sample No. 27 from the Hampden Mine, no flux would be needed, and the smaller proportion of coke—as formerly explained—in pyritic smelting would reduce smelting cost to 22s. per ton." Mr. Gibb further estimates the profit per ton of ore to be £2 5s. 4d. He concludes that though the pyritic slate is very suitable for the cementation process, the cost of wet extraction including precipitant, would be £1 9s. 11d. per ton of ore, and, owing to the extreme slowness of natural oxidation, there would be no other advantage in adopting that process as against smelting.

9. Mr. Savage in a detailed report estimates that there is 183,000 tons of 11% ore in the kaolinised part of the lode, measuring 600 yds. long, 40 yds. wide, and 17 yds. deep.

DEVELOPMENT.

It will be noticed that except at shafts VII., 1, 2, and 3 and opencuts Nos. 1 and 2, little has been done here since Mr. Cameron's visit. Mr. Smith, though ill at the time, helped me in every way during my brief stay at the Hampden.


M L. 408
3 Ch
Small pits on bunches of Gossan in Diorite
2' Gossan in Diorite
Non Ferruginous Slates with bunches of Quar
Shallow Shaft on 3' bunches of Gossan with Carbonates & Silicates
30' decomposed Diorite
Slates
Pyrite
Trench
Shaft 37' deep
Very poor material from Shaft
Pit
Trench in soft white rock with Copper impregnations
Shaft
Opencut No3
Ore in soft white Felspathic rock
Trench
Shaft V
20' deep in ore
Trench No23 "35' ore"
Shaft VIII 8' deep
Poor Cuprif Kaolin
Trench
No2 Main Shaft
Felspathic material carrying ore
Trench No2
ore
Trench No22
Trench No21
37' in ore
Slates
White Kaolinic material carrying ore
Kaolinised stockwork
Trench No3
Shaft 12' deep in white Kaolin
ore
Pit
Shaft X
15' deep Filled in
Mag. North
Contact of Schist & Diorite
Assumed
M L 245
Swampy Flat
Slates
"Ore 40' wide"
Shaft IX 17' deep
Shaft XII 135' Pyritic heap
36' showing Cu Pyrites 6% 106' Slate with seams of Pyrites 6% - 10%
6' ore
Shaft XI 52' deep
Trench No4
Pit
Trench No5
"4' ore"
Ore & Slates
Trench No6
M L 407
Big bunch Gossan in bottom of cut
Opencut No2
23' ore
Shaft I 66' deep
Opencut
Fragments of Diorite on surface
Cuprif Kaolin very rich in cut 3' wide
Trench No8
ore showing
No1 Main Shaft
Schists
M. L 405
Trench No9
Trench
Pit
"6' ore"
Cuprif Kaolin

The workings extend from Block 15 on the south into M.L. 408 on the north, and comprise besides numerous pits, over 30 trenches, three opencuts, and 20 shafts, as shown on the accompanying plan by Mr. Fraser.

The trenches are from 3 to 200 ft. in length, and mostly less than 5 ft. in depth.

Open cut No. 1, near the centre of M.L. 244, is very irregular in form its greatest length being 3 chains and its width from 60 ft. to 140 ft., while its greatest depth is less than 20 ft. The cut is now being extended westwards.

Open cut No. 2 is 5 ch. in total length, but of this over a chain is simply an approach. Its average width is 40 ft., and its greatest depth is 30 ft.

Open cut No. 3, in the southern part of M.L. 245, is 40 ft. in length, and little can now be seen in it.

Shaft I. (in the side of open cut No. 2) is 66 ft. deep, and has short crosscuts east and west. Inaccessible.

Shaft II. on the ridge to the north of No. 1 cut is 84 ft. deep; at the 43 ft. level it has a crosscut 75 ft. to the west, and a drive 30 ft. to the south; and at the 84 ft. level a crosscut 65 ft. to the west. Inaccessible.

Shaft III. in No. 1 opencut was sunk 18 ft., and had a long crosscut running west-north-westwards.

Shaft IV. (near the southern boundary of M.L. 244) is 73 ft. deep, and has crosscuts 70 ft. east and 70 ft. north-west at the 60 ft. level. Inaccessible.

Shaft V. in the southern part of M.L. 244 is 45 ft. deep, and has crosscuts 40 ft. east and 60 ft. west. Inaccessible.

Shaft VI. 20 ft. deep with crosscuts 30 ft. in length at the bottom is at the south-eastern end of opencut No. 3. (It is incorrectly marked V. on the attached plan.) Inaccessible.

Shaft VII. in the northern part of M.L. 245 is 54 ft. deep and at the 50 ft. level has drives 60 ft. north and 150 ft. south with crosscuts 160 ft. east and 45 ft. west, at 20 ft. south of the shaft. In the western crosscut at 60 ft. from the main drive there is a 41 ft. winze.

Shaft VIII., in trench No. 23, is only 8 ft. deep. Inaccessible.

Shaft IX. in the centre of M.L. 245 is 19 ft. deep. Inaccessible.

Shaft X., ½ ch. to the north, is only 15 ft. deep and is filled in.

Shaft XI. is 52 ft. deep, and has cross cuts 20 ft. east and west. Inaccessible.

Shaft XII., between 9 and 11, is 135 ft. deep. A small winch has been installed here, and the shaft was being unwatered by baling in January, 1907, when an inspection was made—under difficulties. At the 80 ft. level there is a drive to the south off the western crosscut, and a drive for 45 ft. north from the shaft. At the 100 ft. level there is a crosscut in 15 ft. to the east, and a drive for over 100 ft. north of the shaft. A winze extends from the 80 ft. level to the 120 ft. level.

No. 1 main shaft is located off the lode in M.L. 245, near the dividing line with M.L. 245. It is now 40 ft. deep.

No. 2 main shaft has already been sunk 66 ft.—*i.e.*, to water-level.

No. 3 main shaft has also reached water-level.

These three shafts (each 12 ft. × 4 ft. in clear) are to be sunk to 200 ft. below the surface, and connected by driving, after which the deposit will be blocked out and sampled.

The well on M.L. 406 is 70 ft. deep in chloritic schist, and has a drive 40 ft. in length. The supply is 60 gall. per hour.

The workings on the Hampden North, all adjacent to M.L. 245, include several potholes and trenches, and one shaft 30 ft. deep.

OUTPUT.

		Tons.				£	s.	d.
1898—	... ...	10	37 %	copper				
1901—2nd quarter	Co.	$314\frac{10}{20}$	37 %	,,	valued at	9,646	0	0
. —3rd ,,	,, ...	198	36 %					
1902—								
1903—								
1904—	Trib. No. 1 ...	$118\frac{10}{20}$	30 %			2,148	8	0
	,, No. 2 ...	29	30 %			546	0	0
1905—	,, No. 2 ...	13	30 %			269	2	6
	,, ,, ...	131				3,026	10	0
(Ferguson)	,, ,, ...	$11\frac{10}{20}$				252	18	0
	Co.	16				316	16	0
1906—3rd quarter (Ferguson)	...	41				984	0	0
		12						
Total ...	... ...	$924\frac{10}{20}$						

anying Mr. Cameron's report shows a belt with a uniform width of 50 ft. As a matter of fact, in spite of the multitude of workings, ıe exact width of the ore-bearing country has not yet been deterıined.

In the trenches and open cuts the country can be seen to be ıpriferous over widths of from 3 ft. to 3 ch., and two parallel well arked copper-bearing zones, 1 to 2 ch. apart, can be traced through ıe leases, with interruptions and possibly in one or two cases coalesng; but there is no indication that the ores have infilled open ıannels, which would constitute a lode in the accepted sense. The es near the surface occur as bunches and irregular veins in kaolinised ates, and the deposits should therefore be designated a stockwork.

The ore near the centres of the bunches is pure chalcocite, but ıtwards it gradually becomes impure, and ultimately shades into ained kaolin.

The richer ores have been found in only four circumscribed areas -probably the outcrops of shoots which, there is some evidence to ıow, are pitching southwards. The work done in shaft No. 12 dicated that secondary enrichment has taken place to a depth of at ast 100 ft. in the country between the shoots. Consequently no nsiderable diminution of the average amount of copper per cubic ırd is to be anticipated in the richer shoots for 100 ft. beneath the ırface, the ores near the surface being richer but more scattered ıan in the neighbourhood of the water level.

The Hampden deposits have some resemblance to those worked Clausthal, in the Hartz*, where occur zones of altered rock (clay ates, dipping slightly but foliated parallel to a plane of movement), to 262 ft. wide, extending as far as 9 miles, and in which the ore dies are somewhat irregularly distributed. The zones are the result the friction of great masses which have been rubbed together. ılena pyrite and blende are the chief ores.

The occurrence of hæmatite at Mount Sylvia, in the immediate cinity of Hampden, points strongly, however, to the ore-bodies ing due to regional metamorphism of originally cupriferous eruptive cks—the "diorite" found within short distances of the main workgs. These conditions are not unfavourable for permanence in depth, the copper derived from these rocks has been deposited in a crushed histose) zone traceable for long distances along the surface, and for at reason likely to descend below the limits of practical mining.

ORE BODIES.

The trenches have been opened for many years, and the exposures e therefore now not of the best; but in most of those on M.Ls. 244

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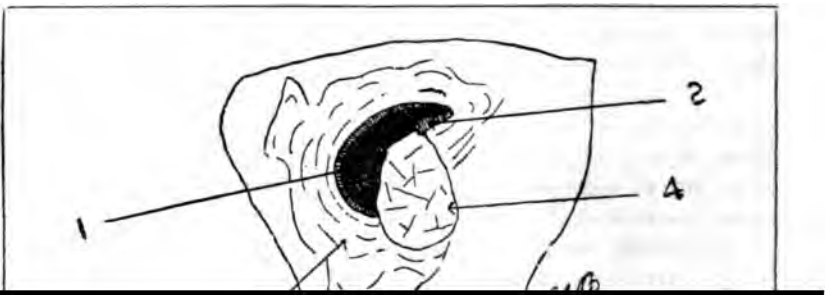
* Genesis of Ore Deposits. By Prof. Franz Posepny, p. 79.

and 245 cupriferous (carbonate) bands of country can be distinguished, and from many of them fair quantities of ore have been taken. The open cuts (Nos. 1 and 2), however, afford valuable information as to the nature of the deposits.

Open cut No. 1 is on the site of the richest area of ground yet located at Hampden. The ore, of which indications were first found by trenching and crosscutting from shaft III., consists of irregular bunches of cuprite and glance in kaolinised slates probably forming an indistinct shoot at least a chain wide pitching southwards beneath barren kaolin forming the southern side of the cut. The ore raised prior to 1901 from the cut, of which only the firsts have been shipped, comprised:

280 tons	40%
1,500 ,,	13%
55 ,,	6½%

Further quantities were obtained by the No. 1 tributers in 1904, and in removing the overburden west of the cut the manager is now recovering some rich ore. At the time of my visit in January 50 tons had been stacked. In this are scattered irregularly shaped kernels of cuprite, surrounded by encrusting laminated chrysocolla gradually passing outwards into slightly stained kaolin (Fig. 4).



the ground is believed to be richer underfoot. Still, breaking down is to be continued, as the tributers last working naturally left only the poorest ore standing. The ore raised from the part of the cut north of shaft I. prior to 1901 included:

200 tons	40%
364 ,, ...	13%
1,184 ,, ...	6½%

The No. 1 tributers during 1904 extended the cut, and considerably augmented the heaps of ore at grass.*

Near the bottom of the cut is a body of gossan, in the interior of which some pyritic ore was found. This was originally chalcopyrite. It presents the appearance of having been cracked in all directions and subjected to leaching along the faces formed. Some of the copper has been redeposited in the openings as glance and cuprite, while oxidation has taken place to malachite and tenorite. The ore therefore, though at first glance thought very poor, proves to be moderately high in grade.

Opencut No. 3 yielded previously to 1901:

7 tons	40%
28 ,, ...	13%
8 ,, ...	6½%

besides which rich ore is reported underfoot. The cut exposes a kaolinised stockwork.

In shaft I. a body of glance was struck, yielding 75 tons of 20% ore.

In shaft II. white kaolin, with bunches of pyrite (carrying 1% copper) was found below black slate, with pyrite on joints.

Shaft III. proved the rich ore afterwards worked in open cut No. 1.

In shaft IV. rich ore was struck in sinking, and pyrite is also reported from it. It is understood that the slates dipped steeply west-

---

* Mr. Gibb tabulates the following analyses of ore from No. 2 opencut (Government Analyst):—

S = selected for shipment.
R = rejected from ore raised.

		S.	S.	R.	R.
Copper	=	32·1	42·1	24·1	11·0
Silica	=	31·2	19·2	38·4	52·9
Iron protoxide ...	=	4·6	7·6	5·5	3·5
Alumina	=	8·8	4·3	8·6	13·9
Lime	=	trace	trace	0·5	0·5
Sulphur	=	—	6·4	—	—
		76·7	79·6	77·1	81·8
Gold	=	trace			
Silver	=	9 dwt. per ton.			

wards in the western crosscut. The ore-body was reported in 1900 to be 70 ft. wide at the 60-ft. level, and to assay up to 20%.* The total raised was:—

13 tons	... ... 40%
28 ,,	... ... 13%
197 ,,	... ... 6½%

The ore at grass consists of kaolinised slate with veins of carbonate-bearing kaolin passing into fairly rich oxide and glance ore.

Shaft V. was sunk in ore, but no classification was made of it. The manager in 1900 reported 111 tons of 13% ore at grass.

In the shaft VI. 30 ft. of ore was reported in the crosscuts.

In sinking VII. shaft a large body of ore was met, and the ore raised comprised:

12 tons	... ... 40% ore
72 ,,	... ... 13% ,,

During 1905 and 1906 an additional 200 tons of ore—black oxide (?) and glance, with stains of malachite—running from 38 to 51% copper, was broken down in the stopes just north of this shaft. It was possible to descend these stopes to the 50 ft. level, and it was then found that the irregular ore-body worked in the stopes had been driven on for 40 ft. north of the shaft, beyond which the country is only slightly stained but kaolinised. South of the shaft kaolinised slates, dipping 80° to the east show only occasional signs of ore, but there is a cap of gossan half-way along the drive. There is a possibility of bodies being tapped by short crosscuts, and the gossan cap should be sunk on. In the western crosscut only a few small patches but at the 80-ft. level friable pyrite[*] as bunches and veins, with some coatings of secondary sulphide, could be seen in kaolin, the whole apparently a partly oxidised and leached stockwork.[†] On the 100-ft. level sulphides can be seen near the shaft, but the northern drive shows little sign of ore, the country being slate. The northern drive on the 100 ft. level is in slate.[‡]

No. 2 main shaft struck siliceous gossan dipping west and pitching south at a depth of 45 ft.

No. 3 main shaft has as yet proved only barren slate.

Most of the workings on the Hampden North are in diorite, in which small and irregular bodies of gossan can be seen, in one place carrying both malachite and chrysocolla. The slates would appear to have been deflected to the north-east, where some prospecting should therefore be done.

PROBABLE ORE.

The first rich area may be taken to extend from open cut No. 1, near the northern boundary of M.L. 245, almost to shaft No. 10—a distance of 450 ft.; and it has been proved in places to be 30 ft. wide, while it may have double that width in others. The second (at opencut No. 2), in M.L. 245, is 400 ft. long, and up to 40 ft. wide. The third (at opencut No. 1), in M.L. No. 244, is 300 ft. long and 200 ft. wide. The fourth, at the southern boundary of M.L. 244, is 200 ft. long and 20 ft. wide. These areas, it must be understood, are exceedingly ill defined, and the amount of ore available is very problematical.

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[*] Analysis given by Mr. Gibb, of "pyrite" (Government Analyst):—

Copper ... ... = 0·3 %
Silica ... ... = 11·0
Iron protoxide ... = 48·1
Alumina ... ... = 4·1
Sulphur ... ... = 37·6
101·1
Gold = trace
Silver = trace

[†] Analysis, tabulated by Mr. Gibb, of "pyritic slate" from drives at the 80 ft and 100 ft. levels, No. 12 shaft (Government Analyst):—

Copper ... ... = 10·5
Silica ... ... = 13·1
Iron protoxide ... = 39·8
Alumina ... ... = 6·6
Sulphur ... ... = 27·3
97·3
Gold = 10 gr. per ton
Silver = 1 oz. 0 dwt. 14 „ „ „

[‡] Analysis, given by Mr. Gibb, of "country rock" (Government Analyst):—

Copper ... .. = 0·8 %
Silica ... ... = 57·1
Iron protoxide ... = 7·5
65·4

Taking the areas given above, the total material in the shoots above the 100-ft. level, assuming 15 cub. ft. per ton, will be 625,000 tons. The ore taken from the open cuts, reduced to a 10% basis, amounted to two-thirds of the material moved. But there is a likelihood of the average being below this, and, for purposes of illustration, placing it at one-sixth, the probable amount of 10% ore above the 100-ft. level will be 100,000 tons. The total quantity of ore in the shoots may be much less than this, but will then be of correspondingly higher grade.

TREATMENT.

Till recently, with cartage to Hughenden costing £8 per ton and railway and shipping freight 30s. extra, the total cost of mining, transporting, and treating (at customs works) a ton of 30% ore has amounted to nearly £14; and even with the railway at Cloncurry and cheapened mining costs it is likely to still reach £8. At the present time nothing less than 20% is bagged, and even with copper at £100 per ton nothing less than 10% ore would pay to ship, and a slight fall would necessitate closing down the mine.

The company has therefore always desired concentration, but their ores, so far proved, are chiefly oxidised, and not suited for vanning, and they now propose to erect smelters. The scarcity of timber in the district is a recognised difficulty, but it is hoped to make up for this deficiency by the addition of sulphides from the lower levels.

None of the wet processes have yet been considered, but that known as Neill's should certainly be given a trial. In this process the sulphur dioxide given off during roasting is used to dissolve oxides and carbonates as sulphite, which is precipitated by heat and reduced to metallic copper simply by fusion, sulphur dioxide being regenerated*.

ORE DEPOSITS.

At the southern end of the lease there are crops of ferruginous clay slates over a width of two chains, with blows of silioeous gossan 6 ft. thick and a chain long, two chains apart. The main shaft was sunk alongside one of these blows, in black pyritous slates dipping steeply to the east, but failed to prove it continuous downwards, and in the crosscut only slates were found—dipping steeply west.

In the open cut, near the northern boundary and east of any of the Hampden workings, black slates occur, veined with green carbonate and strongly impregnated with chalcocite over a width of 10 ft. (Fig. 5).

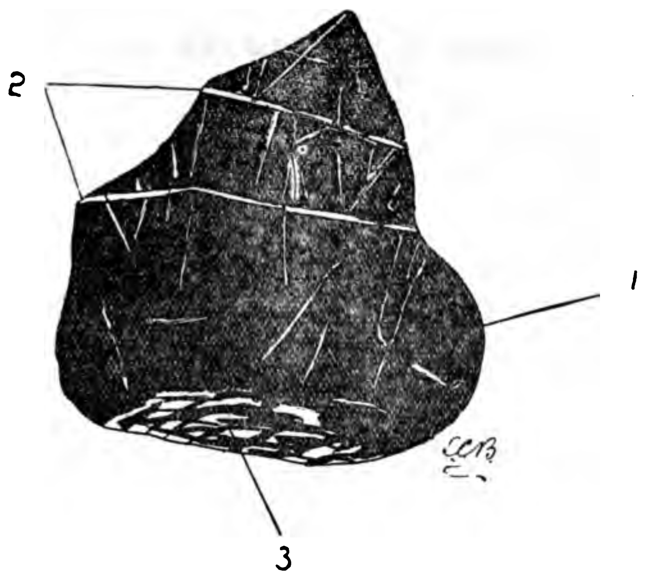


FIG. 5.—(NATURAL SIZE), STOCKWORK, OPENCUT BLOCK 15.

1. Black slate, with disseminated chalcocite. *2. Malachite.* *3. Malachite replacing slate.*

The trench to the west of this exposes slate, veined and impregnated with carbonate and oxide. About 30 tons of ore has been stacked, probably containing 5% copper.

Two chains south of this is another trench and shaft, where silicified gossan is visible at the surface; while below is limonite with quartz crystals and stains of malachite. There is about 20 tons of 1% ore stacked here.

There is thus—except the chalcocite slate in the open cut—nothing of present value showing on Block 15, though copper ore may be found beneath the gossan; but there is some hope of the southernmost shoot of rich ore in M.L. 244 pitching into this property at a depth.

Mount Sylvia (M.L. 422).

LOCATION, ETC.

Mount Sylvia lies about 1½ miles south-east of the Hampden workings.

This lease of 10 ac. is held by the Hampden Company for ironstone flux.

ORE.

Mr. Smith informed me that the ore assays 87·87% iron oxide. Specimens given me consist of non-magnetic crystalline granular hæmatite, with thin veins of limonite. The association of hæmatite deposits with those of copper is suggestive, again, of a genesis due to regional metamorphism.

Hampden South Extended (M.L. 394).

LOCATION, ETC.

Adjoining M.L. 246 on the south.

Its area is 10 ac. Unmanned when inspected.

One trench 2 ch. from south-western corner on the southern boundary is the only development.

DEPOSITS.

In the trench 2 ft. of limonite, with secondary silica, can be seen, as well as on the surface for a few chains to the north. This is probably only a bunch, but is worth sinking on, being on the continuation of the Hampden line.

Another crop of quartz-bearing gossan, lying 5 ch. north of the

Hampden South Extended Block (M.L. 410).

Location, Etc.

This adjoins M.L. 394 on the east.

The area of the lease is 10 ac., but there are no workings, and no deposits have been exposed. No one was present on the ground when my inspection was made.

Hampden Central (M.L. 501).

Location, Etc.

This adjoins M.Ls. 394 and 410 on the south.

The area of the lease is 31 ac. The workings comprise only one trench, and the lease was deserted when visited.

Deposits.

Only thin veins of carbonate in slate have yet been found here—nothing of importance.

Hampden South (M.L. 502).

Location, Etc.

The Hampden South adjoins M.L. 501 on the south.

Its area is 31 ac. The lease was unmanned when inspected, but Mr. Hazard, one of the former owners, conducted me over it.

Workings.

Three trenches and two potholes. Pothole (*a*), 4 ft. deep, is 5 ch. from the southern boundary; trench (*a*) is ¾ ch. to the north; shaft (*b*), 10 ft. deep, is ½ ch. beyond; trench (*b*), 6 ft. deep, is ½ ch. beyond; and cut (*c*) is 5 ch. further north.

Ore Deposit.

The crop is a well marked one of ferruginous quartzite passing into siliceous limonite and gossan (generally with a body of cellular limonite on the east), standing in some places 5 ft. above the ground, and exposed for a length of 12 ch. from the southern boundary. Its dip seems to be to the east.

The main workings are along the eastern side of the crop, adjacent to where the crop is most siliceous. The main shaft (*b*) is sunk wholly in cellular limonite, with quartz crystallised in cavities, and containing disseminated malachite. About two tons of 15% ore have been paddocked, while 7 bags of picked ore are reported to have yielded 20%.

The deposit should be sunk on where less siliceous, as such cellular limonite must overlie copper ore—probably of some richness.

The country rock near the crop is slate, but diorite occurs within a few chains to the north-east.

Azurite (M.L. 561).

Brady and McBride.

LOCATION, ETC.

The Azurite lies 4 miles east of Hampden.
Its area is 5 ac. It was not visited.

Carbonate (M.L. 558).

Brady and McBride.

LOCATION, ETC.

The Carbonate adjoins the Azurite on the east.
Its area is 5 ac. It was not visited.

True Blue (M.L. 591).

Grey and Wheatley.

LOCATION, ETC.

The True Blue lies 1½ miles west-north-west of the Azurite.
Its area is 9$\frac{8}{10}$ ac. It was not visited.

Block 33 (M.L. 247).

Mgr., Orr.

LOCATION, ETC.

Block 33 (or the Hampden West) lies 3½ miles west of Hampde[illegible]

Monitor (M.L. 419).

Mgr., McEvoy.

LOCATION, ETC.

The Monitor is 44 miles south of Cloncurry, 8½ miles southwest from Hampden, and ½-mile from the Cloncurry River.

The area of the lease is 5 ac.

DEVELOPMENT.

The main shaft is 40 ft. deep; down to 15 ft. it is 10 ft. wide and 20 ft. long, and below it is 5 ft. wide and 10 ft. long. Only one other trench, 2 ch. to the south-east, was seen.

OUTPUT.

Total—65 tons despatched, 30 to 40 % copper (*fide* Mr. McEvoy).

There are no returns in the Warden's reports of ore from the Monitor.

ORE-BODIES.

In the southern trench a gritty kaolinised rock striking north-north-east is exposed. This rock shows flakes and stains of malachite, but the average tenor of copper is below ½%.

Northwards towards the main shaft ferruginous quartzite crops out alongside schistose slate, and at the shaft schists and quartzites over a width of 10 ft. have been irregularly impregnated and replaced by copper ore. Near the surface the rocks are stained by malachite and azurite and carry bunches of ore (limonite, malachite, and glance). The dark chloritic schist towards the shaft bottom is reticulated by thin veins of malachite, and contains splashes of glance, the ore on the whole being rather better than that above.

Some 65 tons of 30 to 40% ore have been despatched, and the seconds—dark slate with malachite and azurite stains—amounting to 150 tons, should contain 5% copper. There is also at the brace 3 tons of ore last raised—comprising black schistose quartz-veined slate, seamed in all directions by malachite (as on Hampden Block 15), and carrying a few bunches of tile ore. This, as it stands, should assay over 10 per cent. copper.

Monitor North (M.L. 533).

LOCATION, ETC.

This adjoins the Monitor on the north.

Its area is 5 ac. No work has been done on this.

Monitor South (M.L. 534).

LOCATION, ETC.

This adjoins the Monitor on the south.

Its area is 5 ac. No developments have yet taken place here.

Mount Devoncourt (M.L. 550).

Mgr., Staubwasser.

LOCATION.

Mount Devoncourt lies 12 miles south-east of Devoncourt, on the main branch of the Cloncurry River, 2 miles from the Hampden road, and 42 miles south slightly west from Cloncurry. It is not shown on the lease map.

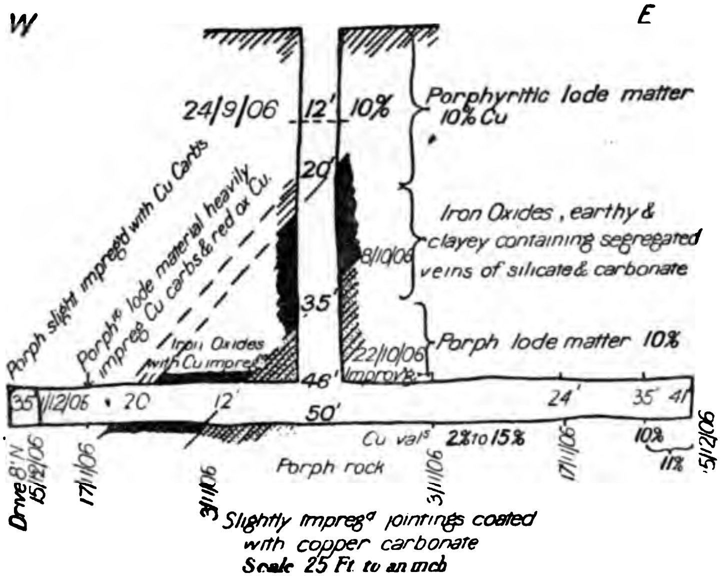
The hills both north and south of the Cloncurry River rise to a fairly uniform elevation of about 100 ft. above the flood plain, of the Cloncurry River and mark the level of a peneplain, out of which the river has cut its valley.

AREA.

The area is 10 ac. The lease was taken up under the name of Mount Merlin, but is more commonly known as the Devoncourt. It is rumoured that the Mount Merlin Company has abandoned the mine, but the manager's reports make it unlikely to be the case.

The mine was deserted during my stay in the locality, and an attempt made to locate it proved unsuccessful, owing to inadequate directions.

material carrying 10% copper to 46 ft. depth, but the porphyritic rock in the shaft bottom is only slightly impregnated, though the jointings are coated, with copper carbonate.


W
E
24/9/06
12'
10%
Porphyritic lode matter 10% Cu
20'
Porph slight impreg^d with Cu Carbs
Porph^c lode material heavily impreg Cu carbs & red ox Cu.
Iron Oxides, earthy & clayey containing segregated veins of silicate & carbonate
8/10/06
35'
Porph lode matter 10%
Iron Oxides with Cu impreg
22/10/06
Improving
46'
35
1/12/06
20
12'
50'
24'
35'
41'
Cu val^s 2% to 15%
10%
11%
Porph rock
Drive 8' N. 15/12/06
17/11/06
3/11/06
3/11/06
17/11/06
5/12/06
Slightly impreg^d jointings coated with copper carbonate
Scale 25 Ft. to an inch
0
25
50
75

SKETCH SECTION OF MAIN SHAFT, MOUNT DEVONCOURT.

The western crosscut is in "iron oxides, with small patches of copper impregnations" for from 12 ft. to 20 ft. from the shaft, and adjacent to this body is "porphyritic lode material heavily impregnated with copper carbonates and red oxide of copper," but the drive at the end of the crosscut is "in porphyry, slightly impregnated with copper carbonates."

In the eastern crosscut the amount of copper gradually increased with distance from the shaft, and between 12 ft. and 24 ft., it varied from 2 to 15%, the average of the last 6 ft. being 11%.

From these data it would appear that there is a gossan body, 10 ft. thick, dipping westwards through the shaft and the western crosscut. This, if correctly described by the manager, should prove rich in copper above water level, below which cupriferous pyrite may be expected. The whole formation exposed on the 50 ft. level would appear to be a deposit of some promise, the manager's statement being: "At the 50 ft. level we have a copper-bearing formation 70 ft. wide, with ore still showing in the eastern face of crosscut. The copper occurs as an impregnation of porphyry, the copper content varying from 2 to 14%."

During my search for the mine it was noted that the country in this vicinity comprises felspathoid and granitoid rocks—apparently highly metamorphosed sedimentaries, with interbedded crushed porphyries. Attention has elsewhere in this report been drawn to the importance attached to low-grade chalcocite deposits in porphyry at Ely, Nevada, U.S.A., where in one mine the rock has been leached from the surface to 50 ft. or 100 ft. below, but still deeper has uniform though low copper values.

Wooluma (M.L. 631).

Location, Etc.

The Wooluma lies ½ mile north of the Monitor.

Its area is 10 ac. It was not visited.

Ore-bodies.

This lease is believed to be on the coutinuation of the Monitor line.

The Gorge (M.L. 484).

Location, Etc.

The Gorge is believed to lie 1½ mile west of the Monitor.

Its area is 20 ac. It was not visited.

FLORENCE RIVER.

The Florence mines are rather scattered. They comprise only leases with 19 claims and 3 prospecting areas.

The following is a list of holdings in force at the end of the year 06, of which the particulars available do not warrant their treatment der separate headings.

McPhail North (M.C. 200).—This adjoins the McPhail on the rth. Its area is 800 ft. × 350 ft. No work has been done here.

McPhail South (Extended M.C. 234).—This adjoins the McPhail on e south. Its area is 800 ft. × 350 ft. No work has been done on it.

Edmonson (M.C. 222).—The Edmonson is near the McPhail. Its ea is 1,600 ft. × 350 ft.

Dodger (M.C. 371).—The Dodger lies 3 miles south-east of the Phail. Its area is 400 ft. × 350 ft.

Bobby Dazzler (Extended M.C. 365).—This is 2 miles north-west Native Police Waterhole, Florence, and about 5 miles east of the Phail. Its area is 400 ft. × 350 ft.

Lottery (P.A. 301).—It is 3 miles north-west of the McPhail. Its a is 10 ac.

Orion's Belt (P.A. 260).—This is 4 miles west of Hart's Camp. Its a is 10 ac.

Frances (Extended M.C. 251).—This is at the Florence Waterhole. area is 400 ft. × 350 ft.

United (Extended M.C. 369).—Florence. Its area is 600 × 350 ft.

Better Luck (M.L. 580).—Florence. Its area is 9 ac.

Our Luck (M.C. 125).—Florence River. Its area is 200 × 350 ft.

Myall King (Extended M.C. 243).—Florence. Its area is 0 ft. × 350 ft.

Eclipse (M.C. 236).—Florence. Its area is 800 ft. × 350 ft.

Lady May (Extended M.C. 285).—Florence. Its area is 800 ft. × 0 ft. Output: 1906—7 tons.

Theresa (M.C. 271).—Florence. Its area is 200 ft. × 350 ft.

Juno (Extended M.C. 274).—Florence. Its area is 800 ft. × 0 ft.

Queen Cross (M.C. 260).—Florence. Its area is 1,600 ft. × 350 ft.

Vivian (M.C. 259).—Florence. Its area is 1,600 ft. × 350 ft.

Gem (M.C. 344).—Florence. Its area is 400 ft. × 350 ft. Output: 1906—$3\frac{13}{20}$ tons.

Mount Flannagan (Extended M.C. 269).—This is 1 mile south of the Native Police Waterhole on the Florence River. The area is 1,600 ft. × 350 ft.

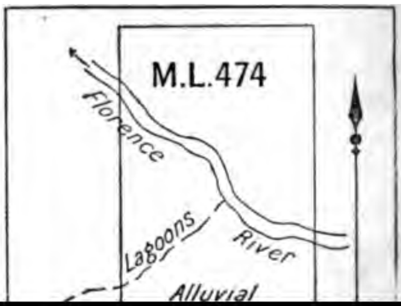
McPhail (M.L. 474).

Mgr., Brady.

LOCATION, AREA, ETC.

The McPhail is located on the Florence River, ½ mile west of the main Hampden road, and 33 miles south from Cloncurry.

Its area is 20 ac. This ground was first secured by a prospector named McPhail in 1884—as the Ironclad gold-mining lease. When visited, the present lease had just been placed under option to the Mount Elliott Company. From Press notices it is learnt that the property



f the lease, and comprise three trenches and a shaft. The southern rench, 3 ch. from the southern boundary is 30 ft. long, and at the astern end is 8 ft. deep. Another trench, 40 ft. to the north, has wo short branches, one to the east, 6 ft. deep, and one to the north, 6 ft. deep. The shaft, 30 ft. to the north of this trench, is 50 ft. deep. The western trench is 3 ch. west of the central trench.

OUTPUT.

	2	tons	shipped, carrying	33%	copper	(*fide* Mr. Brady)
1906 . .	7	,,	,, ,,	24½%	,,	(,, ,,)
Total	9	,,	,,			

ORE-BODIES.

In the south-western corner of the lease a mound of strongly ronstained quartzite and schist, 1 ch. in diameter, rises 15 ft. above he flat. It is on the eastern side of this mound, 1 ch. from the ummit, that the main workings lie; but a trench on the rubble flat, ch. to the west of the latter, opened on a patch of "copper weeds" *polycarpœa*), exposes very promising cupriferous gossan veins with pheres of chrysocolla and malachite. There is consequently a possibility of bunches of ore occuring throughout the intermediate ground, he surface of which is covered with limonite rubble, and this should be borne in mind when sinking is undertaken together with exploratory cross-cutting.

There can have been little outcrop of ore, it being mostly hidden by alluvium, and for the same reason nothing has been proved as to the extent of the deposit, though there is a rumour of the crop having been seen in the river bed.

In the southern cut layers of gossan dipping flatly to the east can be seen, and from the hole at the eastern end of the cut green-stained gossan, containing some pockets of acicular malachite, was raised.

The northern trench exposes a body, 2 ft. 6 in. wide, of malachite-bearing gossan (10% copper), which is flat in the northern arm, but dips steeply to the east in the eastern arm. Gossan occurs beneath this body, and limonite with radiating malachite, and chrysocolla was reported at 16 ft. beneath the surface, but, of course, could not be seen by me because of water. In April, 1906, 7 tons of 24½% ore were despatched from here. Besides this there are 15 tons of seconds (15% copper) at grass, consisting of gossan with veins and bunches of malachite and chrysocolla. (Fig. 6.)

The shaft is said to have been sunk, except for one small block of bleached slate, wholly in ore. That from the upper part consists chiefly of limonite, veined with malachite and chrysocolla, and may carry 10% copper. There is 10 tons of it at grass. At 22 ft. depth an 18-in. seam of richer ore, 2 tons of which yielded 33% copper, is said to have been cut. About ½ cwt. of this ore at the brace consists of chalcopyrite altering into limonite and in parts almost completely replaced by chalcocite. The ore shown me as from the shaft bottom is limonite with disseminated malachite and small bunches of glance.

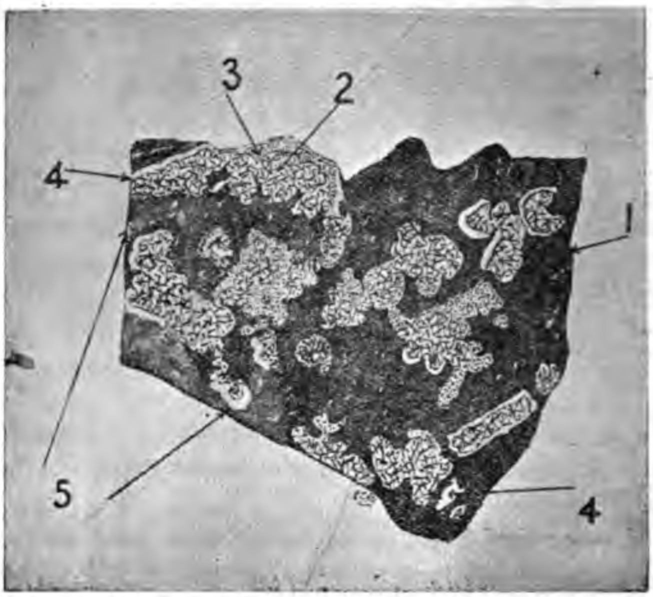


FIG. 6 (NATURAL SIZE).—OXIDISED ORE, M'PHAIL.

1. Limonite.
2. Crystalline malachite
3. Light earthy malachite

4. Chrysocolla (encrusting)
5. Tile ore.

Trump (Extd. M.C. 368).

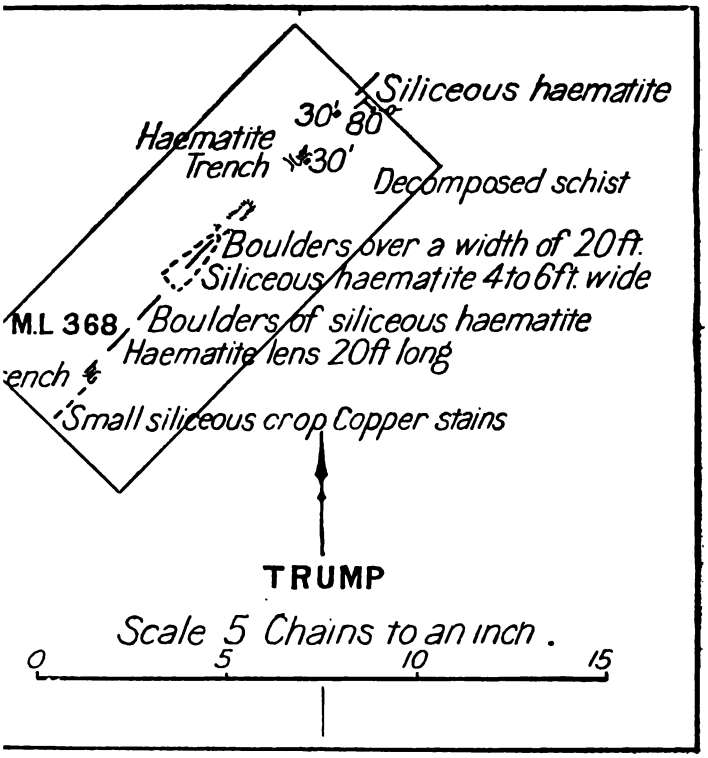
Mgr., McBride.

Location, Area, Etc.

The Trump is about 2 miles south-east of the McPhail.
Its area is 800 ft. × 350 ft.

Development.

The workings comprise three trenches and two shafts. The
ern trench, 1 ch. from the northern boundary, is 20 ft. long
ft. deep; and a costean just to the south is 10 ft. long. The
ern trench is 2 ch. from the southern boundary.



The northern shaft, 1 ch. south of the northern boundary, is
deep.

The second shaft, 15 ft. east of the northern trench, is 30 ft.

Output.

3 tons shipped, carrying 38½ %

ORE-BODIES.

The general strike of the ore-bodies here is north-east, and the dip, which is almost vertical, is to the south-east. The outcrops comprise detached lens-shaped masses of siliceous turgite* (sp. gr., 4·2) from 10 ft. to 2 ch. long and 1 to 6 ft. wide. The best of the copper ore is found between and alongside these outcrops, though a little chrysocolla occurs in some of the turgite.

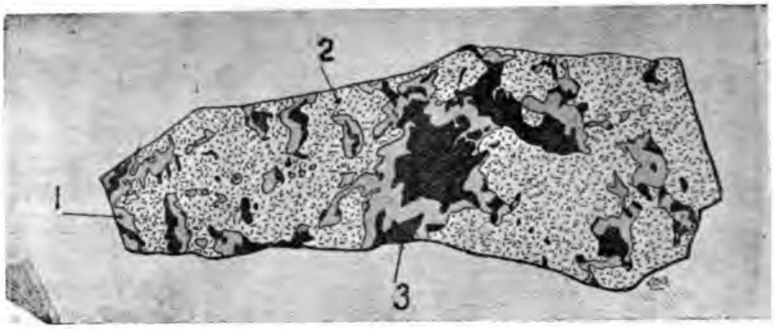


FIG. 7 (DOUBLE NATURAL SIZE).—OXIDISED ORE, TRUMP.

1. Chrysocolla
2. Crystalline malachite
3. Dense limonite.

Crossing the northern boundary there is a crop of siliceous turgite a chain in length.

The northern shaft was sunk in decomposed schist, the footwall country of a body of copper ore at least 2 ft. 6 in. wide. The bulk of this ore is reddish limonite with disseminated malachite and beyond a big crop of siliceous turgite and jasperoid commences. This projects like a wall, 4 to 6 ft. wide, for 2 ch., but towards the south-west, where much silicified limonite (yellow jasperoid) prevails, lode material is found over a width of 40 ft.

Beyond this crop there is a blank of 20 ft., and then boulders of siliceous turgite appear at the surface for 1 ch.; indurated slaty country then shows for 10 ft., when another blow of impure siliceous turgite 1 ch. long is to be seen. At ½ ch. beyond this there is another crop of turgite 20 ft. long and up to 10 ft. wide.

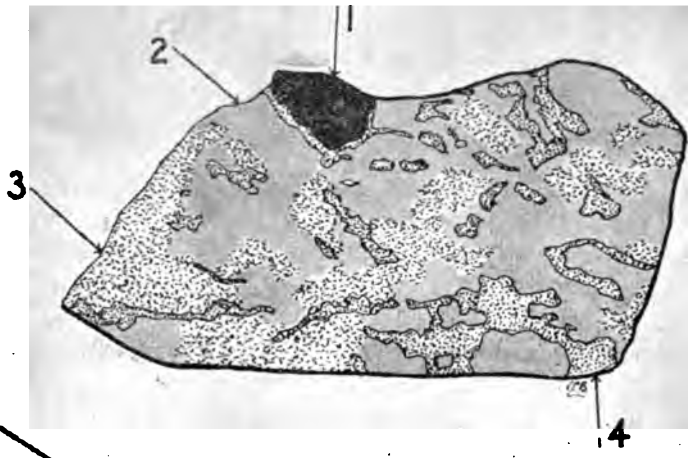


FIG. 8 (DOUBLE NATURAL SIZE).—RICH OXIDISED ORE, NORTH SHAFT, TRUMP.

1. Pyrite veined with limonite	*3. Crystalline glance*
2. Fine grained malachite	*4. Limonite.*

The southern trench, alongside this blow on the east, exposes a small bunch of earthy carbonate ore. Another siliceous slightly copper-stained crop is visible just to the east of this trench, and can be followed for 2½ ch. to the south-west.

GEOLOGY.

This is not a fissure lode, but the ore-bodies presumably occur in a crush zone formed during the metamorphism of the whole region as the occurence of the turgite indicates. The copper ores and turgite have no connection beyond that they have both accumulated in a weak zone, and the turgite is therefore not to be expected to change in depth into sulphides. The ore bodies, however, seem to have a lenticular shape and to alternate, but the copper would seem to have been introduced subsequently to the iron masses—for it is found only between and alongside those masses.

Talk o' the Hills (Extended M.C. 333).

Mgr., Pearson.

LOCATION, AREA, ETC.

This lies 5 miles south-east of Hart's Camp, Florence, and ¾ mile north-east of the Trump.

Its area is 200 ft. × 350 ft.

OUTPUT.

1906 ... 1 ton shipped.

ORE-BODY.

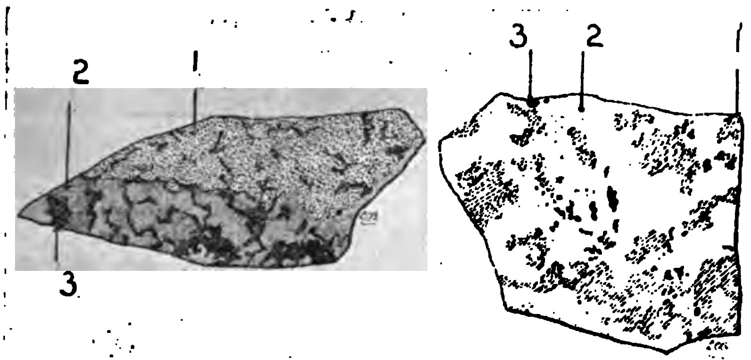
There is reported to be here a small leader of very rich ore and 4 ft. poor red ore, similar to that at the Trump (*i.e.*, turgite), on the line of which this claim is believed to lie.

Dandy (P.A. 297).

Mgr., Jackson.

LOCATION, AREA, ETC.

The Dandy is ¾ mile west-south-west of the Trump, and 2 miles ore (*see* Fig. 9) consisted of siliceous limonite, malachite, chrysocolla (a sky-blue variety, perhaps cyanochalcite), and dense chalcocite, and, together with granular limestone (carrying cuprite) made a body 4 ft. wide. At 6 ft. from the shaft bottom cuprite is associated with ferro-calcite, limonite, and calcite; and the calcite at the bottom carries both cuprite and native copper over a width of 4 ft. The native copper occurs dotted through the ore as small jagged particles (not visibly crystalline), and is always surrounded by cuprite (*see* Fig. 10). There are about 3 tons of silicate ore at grass, which may be expected to carry 10% copper; and 4 tons of the limestone ore (ferro-calcite with nearly one-half cuprite and veins of limonite), probably containing over 40% copper.



FIGS. 9 AND 10 (NATURAL SIZE).—OXIDISED ORE, DANDY.

1. Fine grained malachite
2. Cyanochalcite
3. Limonite.

1. Calcite
2. Cuprite
3. Native copper.

Erin-go-bragh (Extended M.C. 372).

Mgr., Riordan.

LOCATION, AREA, ETC.

This, formerly known as the Alma, lies ½ mile east of the Hampden road, 2 miles north of the Florence River, and 31 miles south of the Cloncurry.

Its area is 800 ft. (?) × 350 ft.

There is one shaft 45 ft. deep.

ORE-BODY.

Unfortunately this claim was not visited, but one of the leaseholders informed me he had a body of silvery glance, 15 in. wide, in the shaft, and that 10 tons of the ore, estimated to carry 45% copper, lay at grass. A specimen of the ore given me consists of almost pure chalcocite, there being only minute specks of the original chalcopyrite and traces of the limonite formed by its oxidation. Stains of malachite and azurite on open cracks are due to recent oxidation of the chalcocite.

OUTPUT.

1905 ...	20	tons shipped,*	40% ore
1906 ...	$6\frac{15}{20}$	,,	,,
Total ...	$26\frac{15}{20}$	,,	,,

---

* Claim then known as the Alma.

MALBON RIVER.

Of the Malbon River groups only the Just-in-Time, on the lower albon, was visited. The groups at the head of the river were not sited because of their being deserted during my stay.

The Eastern Malbon is really on a continuation of the Duck eek belt, the lodes all having an east and west trend. At the Mal- n, however, though the outcrops seem to all mark lines of crush- g, more persistent perhaps than at Duck Creek, the ore bodies are ore limited in size.

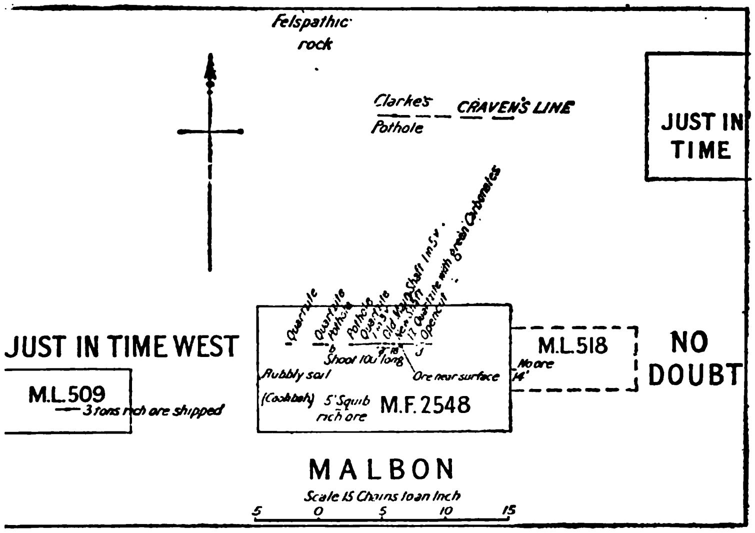
The country is flat, with reddish, sandy soil, or is very slightly lling, and is then rather gravelly. The only timber is stunted gidia d coolibah (or desert gum).

OUTPUT.

The total amount of ore shipped between the beginning of 1901 d the end of 1906 is, according to the available records, 864 tons.

JUST-IN-TIME GROUP.

The Just-in-Time Group is situated on the Malbon River, about miles above its junction with the Cloncurry River.



Malbon (M.F. 2548).

LOCATION, AREA, ETC.

This freehold lies 30 miles south-south-west of Cloncurry, about mile south of the Malbon River and a mile west of the Devoncourt ad. It is often called the Just-in-Time, and is so shown on the ap.*

---

* G.S.Q. Publication No. 213.

Its area is 20 ac. When inspected, the freehold was the property of Messrs. Coats and Robertson, but it has since passed into the hands of the Queensland Copper Freeholds, Ltd.

LITERATURE.

For title of report numbered as below, see Introduction.

(7) Mr. Rutherford concludes thus:

> "This, then, is an irregular deposit of rich copper glance. . . . I believe that this mine will yield up to 100 tons of rich ore similar to that already extracted."

DEVELOPMENT.

The workings include costeaning trenches, two opencuts, two potholes, and two shafts.*

The larger opencut, lying 2½ ch. east of the old main shaft, is 27 ft. long and perhaps 20 ft. deep, but has now fallen in and is flooded below 6 ft.; the other, 30 ft. long and 10 ft. deep, is on the western side of the old main shaft.

The two potholes are 2½ and 4½ ch. west of the old main shaft.

The old main shaft, 3 ch. from the northern boundary and half-way between the eastern and western boundaries, was 27 ft. deep when abandoned, but is now filled in to within a few feet of the surface.

The new main shaft is 40 ft. to the east of the old. It is on the site of an old filled-in shaft, and is now 18 ft. deep. Sinking was being carried on here for the owners by two miners in December, 1906.

OUTPUT.

98 tons shipped by Craven

The deposit here seems to make a bend towards the east-north-east, and the old trenches to the east consequently revealed nothing.[*]

The crop west of the cut comprises 12 in. width of quartzite, with malachite.

At the new main shaft the body increases to 2 ft. in width just beneath the surface.[†]

In the stope east of the old main shaft, at 6 ft. beneath the surface, the ore-body, consisting of a high-grade mixture of malachite and tile ore, is 18 in. thick, but, within a few feet, it increases to 2 ft. 6 in. The footwall here is dipping 5 in 1 h. to the south, is well defined, and is slickensided vertically, and some pug occurs along it. At 22 ft. depth in the shaft, where the dip is steeper than above, it has been reported that there is 4 ft. width of red oxide of copper, and three parcels totalling 32 tons, from a drive at that level, yielded respectively 46%, 48% and 49% copper.

The open cut to the south of this shaft exposed a formation, 18 in. to 2 ft. 6 in. wide, formed of slate replaced to a greater or less extent by malachite, tile ore, and chalcocite. The dip here is 1 in 3 v. to the south.

About 10 ft. west of the open cut quartzite appears and can be followed to the eastern pothole, but there is no crop between that and the western pothole, in which is to be seen 5 ft. width of quartz, quartzite, and silicified slate, stained by malachite, but on the whole very poor in copper. West of this hole there are two crops of quartzite, 1 ch. and ½ ch. in length and separated by a 1½ ch. blank.

Much rich ore is understood to have been shipped from here before the ground was proved to be freehold, and some is stated to have disappeared since. The seconds at grass, amounting to 5 tons, consist of limonite, malachite, and tile ore, and they may run 10% copper; the 3 tons of thirds are very siliceous (70%SiO_2) and probably do contain more than 5% copper.[‡]

Just-in-Time West (M.L. 509).

Mgr., Craven.

LOCATION, AREA, ETC.

This lies 10 ch. (?) west of the Malbon freehold.

Its area is 5 ac. Exempt and idle.

The shaft lies 15 ch. west of the Malbon freehold.

OUTPUT.

3 tons of rich ore have been shipped.

---

[*] The manager reports for May, 1907 :—"No. 2 shaft has not yet started, owing to the lode having been faulted 21 ft. east of open cut; sinking a prospecting shaft there."

[†] This is probably that referred to as shaft No. 1 in the manager's report for May, 1907 :—"The average width of the lode (to 42 ft.) is 3 ft., the average value of the ore 33% copper; the last 15 ft. of the sinking average ore width 4 ft. 2 in., 34% copper."

[‡] The manager reports (June, 1907):—"There are 80 tons of ore in dump, with, say, 30 % copper."

No Doubt (M.L. 518).

Mgr., Allman.

LOCATION, AREA, ETC.

The No Doubt adjoins the Malbon freehold on the east.

Its area is 5 ac. Deserted.

There is one shaft, 14 ft. deep, on the Malbon freehold boundary and 2 ch. south of the freehold line of workings.

No ore-bodies have been exposed.

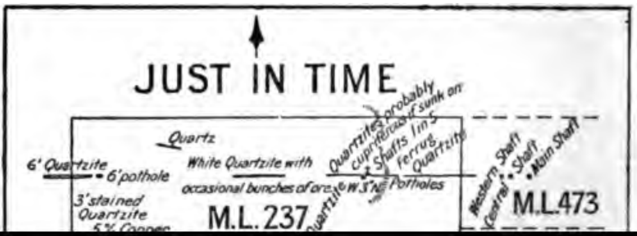
Just-in-Time (M.L. 237).

Mgr., Craven.

LOCATION, AREA, ETC.

The Just-in-Time is about ¼ mile north-east of the Malbon freehold.

Its area is 20 ac. Exempt and idle when visited in December.



(8) Mr. Gibb has tabulated the following analyses (Government Analyst):—

	(c) Country rock.	(r) Rejected from ore raised.
Cu	nil	25·1
SiO_2	57·1	34·2
F_2O_3	13·7	18·1
Al_2O_3	14·4	1·4
CaO	...	trace
S	...	...
	85·2	98·8

OUTPUT.

1901	12	tons (Freehold ?)	shipped, carrying 37·3% copper
1903	33	,, (whole Malbon ?)	,,
1904	36	,,	,,
1906	21	,, (Craven and party ?)	,,
	8	,,	
Total	110	,,	,,

ORE-BODIES.

Quartzite crops both east and west of the shafts, ironstained but barren in the former case, but containing some bunches of ore for 20 ft. in the latter. At 1 ch. west of the shafts the quartzite becomes very ferruginous, and at 2 ch. distance is worth sinking on in search of copper ore. The body then appears to pinch almost out for two or three chains, beyond which white quartzite with occasional bunches of ore crops out.

On the western boundary there is a quartz blow, 6 ft. wide, at the eastern extremity of which the pothole reveals quartzite stained on cracks with malachite and a little tile-ore, over a width of 3 ft., but containing not more than 5% copper.

The quartzites are reported to crop intermittently for miles to the west.

The north-eastern shaft was sunk on the hanging-wall side (the dip being 5 in 1 to the north), and the south-eastern on the footwall side, of a formation of quartz-veined crushed schist, in which occurred bunches of rich ore. There is about 1 ton of the unsorted ore at grass, chiefly a fine-grained and intimate mixture of malachite, chalcocite, and limonite, with patches of gossany tile-ore; also 3 tons of firsts, which contain, say, 10% silica and probably 35% copper; and 10 tons of very siliceous seconds. Analyses of ore from here are given under Literature. Viewed from the surface this body appears to be worth further opening up.

Development both east and west of this lease would seem to indicate that the ore-bodies on the Just-in-Time line are isolated and of no great size.

Just-in-Time, No. 1 East (M.L. 473).

Mgr., Corney.

LOCATION, AREA, ETC.

This adjoins the Just-in-Time lease on the east.

Its area is 10 ac. Exempt and idle. It was last held by the Cloncurry Prospecting Syndicate.

DEVELOPMENT.

The workings, three shafts, lie about 7 ch. east of the Just-in-Time shafts. The western shaft is 15 ft. deep, was sunk in 1903, and some stoping has been done from it. The central shaft, 56 ft. deep[illegible], with drive 40 ft. east at the bottom, is 3 ch. to the east of the [illegible] western, and the main, or eastern shaft, about 50 ft. deep, is 1 ch[illegible] beyond.

OUTPUT.

1905	...	9 tons shipped, carrying 40% copper
1906	...	20 tons ,,
	Total	29 ,,

ORE-BODIES.

The western shaft is in quartzose schist, lenticular bodies [illegible] of which have been found to be cupriferous.

The central shaft was sunk in similar country. Little ore was got above 53 ft., but in the bottom of the shaft and in the eastern

Clarke's (M.C. ?).

LOCATION, ETC.

Clarke's Claim is 15 ch. north of the Malbon freehold and ¼ mile st of the Just-in-Time lease. It was deserted and apparently abanned in December last.

One shaft has been sunk 15 ft.

OUTPUT.

1 ton shipped.

ORE-BODY.

The shaft was sunk on a bunch of ore in quartzite and crushed hist. Malachite occurs over a width of 6 ft., but the average will t exceed 5%.

The seconds at grass, 3 tons, contain carbonate and oxide, and ay run 15% copper, but are very siliceous.

The country to the north-west is felspathic rock, possibly an tered porphyry.

LITERATURE.

For title of report, numbered as below, see Introduction.

(8) The following analyses (Government Analyst) are given in r. Gibbs's report:—

(c) Country rock—
Copper ... ... = nil.
Silica ... ... = 57·1
Iron protoxide ... = 13·7
Alumina ... .. = 14·4
85·2

(r) Rejected from ore raised—
Copper ... ... = 25·1
Silica ... ... = 34·2
Iron protoxide ... = 18·1
Alumina ... ... = 1 4
Lime ... ... = tr.
78·8

Adelaide (M.L. 549).

Mgr., Nathan.

LOCATION, AREA, ETC.

The Adelaide is ¼ mile north of the Just-in-Time lease.

The area is 10 ac. Abandoned.

DEVELOPMENT.

The workings comprise only potholes, trenches, and open cuts. ing from the eastern boundary they are: at 1 ch. an old trench, ft. long, fallen in; after 1½ ch., a trench, 15 ft. long and ft. deep in 12 ft., a pothole, 6 ft. deep; in 10 ft., an en cut, 30 ft. long, 10 ft. wide, and 20 ft. deep, and a 2-ft. trench ntinued 40 ft. to the east; in 1 ch., a trench, 20 ft. long and 2 4 ft. deep; and in ½ ch. a costean.

ORE-BODY.

The ore from the second trench from the east is quartz-veined t carries limonite and malachite, and the contents will run from to 15% copper.

Near the surface, in the open cut, a 2 ft. 6 in. formation, dipping 80° to the south, is exposed, and there is said to be 18 in. solid ore in the bottom beneath the earth fallen in. The manager in December, 1905, reported a lode, 1 ft. to 2 ft. 6 in. wide, of silver-grey ore, assaying 40 to 50%, and the Warden in March, 1906, saw 2 ft. of solid rich ore in the bottom of the cut, 30 ft. from the surface.

In the trench to the west of the open cut there is very siliceous malachite and tile ore, likely to yield 20% copper.

OUTPUT.

1904	...	18	tons shipped		
1905	...	$7\frac{18}{20}$	,, ,,	carrying	32% copper
1906	...	3	,, ,,	,,	35% ,,
		8	,, stacked		
Total		$36\frac{18}{20}$ tons			

Wheeler's shaft, 25 ft. deep, was sunk about 4 ch. east of the above lease. The prospector got 3 tons of rich red oxide, in a trench at the surface, but little or no ore has been raised from the shaft.

Tower's Boys (Extended M.C. 261).

Mgr., Miller.

LOCATION, AREA, ETC.

This lies about 10 ch. east of the Adelaide.

Its area is 1,200 ft. × 350 ft. Abandoned (?)

One shaft is 50 ft. deep, with drives east and west respectively 10 ft. and 12 ft. long.

ORE-BODY.

The material on the tip is quartz-veined schist, with replace-

LIMESTONE CREEK GROUP.

This group is on one of the northern tributaries of the river, midway between the Duck Creek and Corella River Groups.

Huggins Look-Out (M.L. 248).

Mgr., Matheson.

LOCATION, ETC.

Huggins Look-out is located on Limestone Creek, an affluent of the Malbon, 30½ miles south-west of Cloncurry.

Its area is 15 ac. The lease is held by the Willcocks Cloncurry Development Syndicate.

The surveyor's plan indicates workings in the northern part of this lease.

ORE-BODIES.

Mr. Cherry, the Warden, in December, 1903, reported that:—"There are three noticeable outcrops. The formation appears to consist largely of a kind of limestone." In February, 1905, he added:—"There appears to be a considerable quantity of ore available of good smelting quality, low grade. . ."

Huggins Look-in (M.L. 249).

Mgr., Matheson.

LOCATION, ETC.

Huggins Look-in is situated 10 ch. east of Huggins Look-out.

Its area is 15 ac. The lease is the property of the Willcocks Development Company.

Two shafts are shown on the surveyor's plan, one near the centre of the northern boundary and the other 4 ch. to the south-west. The company has not reported any work done.

ORE-BODIES.

The survey plan shows outcrops striking north-east in the northern and western part of the lease.

PINDORA GROUP.

The Pindora is the most easterly of the groups at the head of the Malbon.

Pindora (M.L. 295).

Mgr., Donner.

LOCATION, ETC.

The Pindora lies south of the Malbon River, 39 miles south-west-by-west from Cloncurry.

Its area is 10 ac.

ORE-BODIES.

The survey plan shows a quartz crop striking north-east.

Pindora South (M.L. 296).

Mgr., Donner.

LOCATION, ETC.

The Pindora South lies $\frac{1}{2}$ mile south of the Pindora.

Its area is 10 ac.

One shaft is located in the south-western corner of the ground.

ORE-BODIES.

The surveyor's plan shows an outcrop running north-north-east, along the western side of the lease.

Bevan Consols (M.L. 519).

Mgr., Bevan.

LOCATION, ETC.

The Bevan Consols is understood to lie 2 miles south of the Pindora.

Its area is 9$\frac{8}{10}$ ac.

MOUNT HOWARD GROUP.

The Mount Howard leases lie to the north-west of the Pindora Group.

Mount Howard (M.L. 569).

Lady Maud (M.L. 671).

Mgr., Scott.

Location, Etc.

The Lady Maud is on a southern tributary of the Malbon River 4 miles south-west of the Pindora, and 43 miles south-west-by-west from Cloncurry.

Its area is 14$\frac{9}{10}$ ac.

Wee Taylor (M L. 707).

Location, Etc.

The Wee Taylor, 2 miles south of the Lady Maud.

Its area is 5 ac.

Lady Harriett (M.L. 722).

Location, Etc.

The Lady Harriett is located 1¼ mile south-west of the Wee Taylor.

Its area is 20 ac.

FOUNTAIN SPRING GROUP.

The Fountain Spring Group is located in the range between the heads of the Corella and Malbon Rivers.

Iron Mask (M L. 529.)

Mgr., Donner.

Location, Etc.

The Iron Mask lies 42 miles west-south-west of Cloncurry.

Its area is 20 ac. It is understood that this lease is held by the Wee MacGregor Company as a flux area.

Iron Crown (M.L. 530).

Mgr., Donner.

Location, Etc.

The Iron Crown adjoins the Iron Mask on the south.

Its area is 20 ac. The ground is held by the Wee MacGregor Company for flux.

Lady Lenore (M.L. 633).

Mgr., Allis.

Location, Etc.

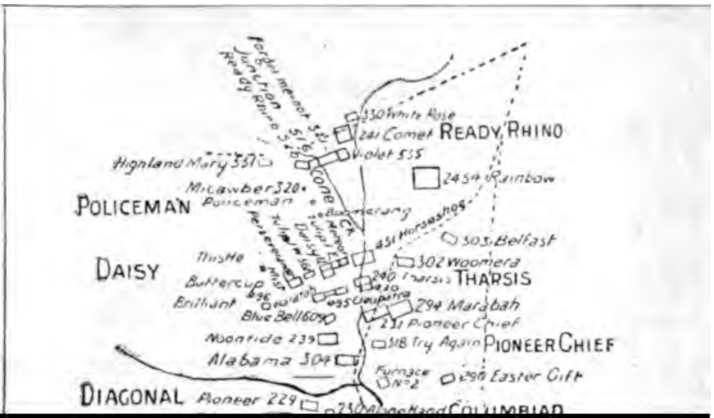
The Lady Lenore is located on one of the eastern tributaries of the Malbon River, 45 miles west-south-west of Cloncurry. It is shown on the map as on a western tributary.

Its area is 5 ac.

DUCK CREEK.

The ore-bodies worked on Duck Creek, Slaty Creek, and the Malbon River occur in crush-zones ("formations,"), striking be east-north-east and east-south-east, all others in the Cloncurry d having a general north and south trend. These zones were pro by the yielding of the country along certain lines under the te forces, which induced the schistosity and metamorphism of the region, rendering it impossible to detect the original lines of st cation, or even to distinguish between sedimentary and igneous without microscopical examination.

Many of the quartz crops were at first mistaken for altered stones, but my opinion is now that, with few, if any, exception quartz either segregated from the schists during their metamor or has been subsequently introduced.

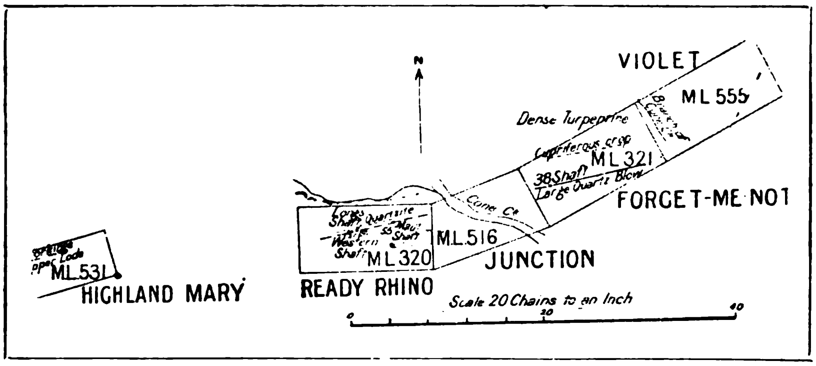


be impossible to make any justifiable estimate of the ore available above any level in any of the mines until it has been completely blocked out.

For purposes of location reference is generally made below to the blast furnace on Mount Start at the junction of Cone and Duck Creeks, 23½ miles south-west by west from Cloncurry.

READY RHINO GROUP.

The Ready Rhino group proper includes only the Ready Rhino, Junction, Forget-Me-Not and Violet—the Highland Mary, Coronet and White Rose occurring really on separate crush-zones, and being here included simply because of their geographical position. The last two differ from others on Duck Creek in dipping northwards.



Highland Mary (M.L. 531).

Mgr., Wallace.

Location, Etc.

The Highland Mary lies ¼ mile west of the Ready Rhino, 2¾ miles north-west-by-north of the blast furnace on Mount Start, and 5 ch. south of the Gorge-Corella road.

Its area is 5 ac. The ground was deserted during my stay in the locality.

Development.

The workings comprise three open-cuts, 1 ch. from, and about half-way along, the northern boundary. The western cut is 18 ft. long and 8 ft. deep; the central, 6 ft. to the east, is 8 ft. long and 6 ft. deep; and the eastern is 12 ft. long and 15 ft. deep. No work had been done since the rain which had fallen two months previously, and the cuts were therefore in a state of collapse. The latest proposal is to sink a shaft to the west of the cuts.

OUTPUT.

1904 ...	4	tons	shipped	by Wallis, carrying 30% copper
1906 ...	3	,,	,,	from the Highland Mary
	10	,,	,,	by Wallace, reported to carry 37 to 39% copper*
Total ...	17	,,	,,	
	$\frac{1}{20}$	,,	at grass	(firsts)
	10	,,	,,	(seconds).

ORE-BODY.

The country here is very flat, and the red soil surface is strewn with quartz fragments, but the Highland Mary ore-body made practically no crop, unlike the Ready Rhino, which passes about 10 ch. to the south. The cuts, however, show the strike to be east 12° north, and the dip 85° to the south-by-east. In the western cut 12 in. width of chrysocolla and gossan is visible, the section between kaolinised slate footwall and granular slate hanging-wall being: gossan and chrysocolla, 12 in.; quartz, 3 in.; and silicified slate, 4 in. In the central cut the lode pinches to 6 in., but in the eastern cut it increases to 15 in. and 18 in. in width, most of which, however, is quartz.

mineral. The seconds at the central cut, bulking 5 tons, consist of quartz and limonite stained by malachite and of black cellular gossan of most promising appearance. The 5 tons seconds at the western cut comprise fragmentary quartz cemented by limonite, and nodules of limonite and earthy turgite with much chrysocolla and malachite, these two minerals in many places fading gradually one into the other. The chrysocolla is typically mammillated in form and, in many parts of the limonite, is also globular. The chrysocolla is more aboundant towards the crust of the nodules, malachite being in excess near the centre, and all stages are exhibited of the replacement of the carbonate by the silicate. Much of the earthy turgite has been porcellanised by deposition of secondary silica and now possesses the same absorptive property as the chrysocolla it encloses. (Fig. 11.)

The state of the workings does not admit of the estimation of available ore, but further development is warranted.

The country rock is more slaty than in most of the Duck Creek mines, having developed only incipient schistosity with comparatively unimportant segregation of quartz. It is greatly weathered and near the ore-body contains much calcareous kaolin. The rock exposed in the western workings may possibly be a highly altered and weathered eruptive. It has a fine micaceous base, in which are set minute crystals of pink orthoclase and lenses of chlorite, the latter thinly coated by granular silica. Amygdaloidal bodies of epidote, surrounded by a thin film of granular silica, are not uncommon and give the rock a volcanic appearance. Similar rock was seen on the Daisy and to the north of the Rainbow freehold.

Ready Rhino (M.L. 320).*

Mgr., Long.

LOCATION, ETC.

The Ready Rhino is located 2½ miles north-north-west of the blast furnace on Mount Start. The main branch of Cone Creek is only 3 ch. to the north-east, and the Gorge-Corella road passes within 10 ch. to the north.

Its area is 10 ac. The lease was being worked by Mr. Jackson for the North Queensland Exploration Company, under an option which extended to December, 1907.

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* Shown on plan incorrectly as 520.

DEVELOPMENT.

The main shaft, which is in the north-eastern part of the lease, is 55 ft. deep, and crosscuts are being opened north and south.*

A second shaft (Long's), 19 ft. deep, lies 4 ch. to the west-by-south, and a third, 21 ft. deep, 30 ft. beyond it. A crosscut is to be opened north from the last. The manager had 5 men at work here in October.

OUTPUT.

1904 ...	4	tons	shipped,	carrying	30 %	copper
	—	,,	,,			
	—					
Total ...	20	,,	,,	,,	27½ %	copper (*fide* Mr. Jackson)
	—					
	9	,,	at grass	,,	35 %	,,
	9	,,	,,	,,	15 %	,,
	6	,,	,,	,,	10 %	,, .

ORE-BODIES.

The Ready Rhino outcrop strikes east 10° north, dipping steeply south-south-eastwards, and consists, as usual, of schist and quartz, making, however, comparatively little show at the surface. The schist-quartz crush-zone is 8 yds. wide, and the copper ore is found chiefly in bunches along the foot- and hanging-walls. All the work yet done has been on the latter, but the proposed crosscuts are intended to prove any ore-bodies on the former at a depth. The crop does not appear in the vicinity of the lease to the west, but is in evidence about 10 ch. south of the Highland Mary workings. It has been traced through the Junction and Forget-Me-Not on the east.

The main shaft is in a formation of crushed schist and quartz, conds remaining amount to 6 tons and consist of quartz with nonite, malachite and a little chalcocite, the average content being)% copper.

Junction (M.L. 516).

Mgr., Jackson.

LOCATION, ETC.

The Junction adjoins the Ready Rhino on the east, and is crossed ›m north-west to south-east by Cone Creek.

Its area is 7 ac. The lease is held by the North Queensland :ploration Company, which had not yet begun operations when it .s visited by me.

Forget-Me-Not (M.L. 321).

Mgr., Long.

LOCATION, ETC.

The Forget-Me-Not adjoins the Junction on the east, and lies tween the main and eastern branch of Cone Creek.

Its area is 10 ac. The lease is being worked under option by Mr. ;kson for the North Queensland Exploration Company.

DEVELOPMENT.

The shaft, which is 2 ch. from the western boundary, has been ık 38 ft., and a crosscut is now being opened on the southern side. 'o men are working here.

ORE-BODIES.

The Ready Rhino formation appears on this lease as a large crop, ıceable to the eastern boundary, of crushed schist and lenticular ısses of quartz, with interstitial bunches of copper ore.

The shaft has been sunk on a copper-bearing band of country on › southern side of the blow. Bunches of copper ore were found to a pth of 20 ft., where was pierced a body of chalcocite, containing artz crystals, the whole 18 in. thick, and dipping 3 in 1 h. to the ɪth, but below the formation is barren of copper and free from ›n. The copper-bearing country is expected to be reached in the ıthern crosscut within 6 ft.

Another parallel crop, lying 3 ch. to the north, shows 1 to 5 ft. quartz, with fairly strong iron stains and frequent bunches of copper ore over the whole length of the lease. In appearance it is more promising than the main crop, but no work has yet been done here.

Violet (M.L. 555).

Mgrs., Long and Jones.

LOCATION, ETC.

The Violet adjoins the Forget-Me-Not on the east.

Its area is 10 ac. The lease had been only lately applied for, and no work had been done in October last.

Coronet (M.C. 241).

Mgr., White.

LOCATION, ETC.

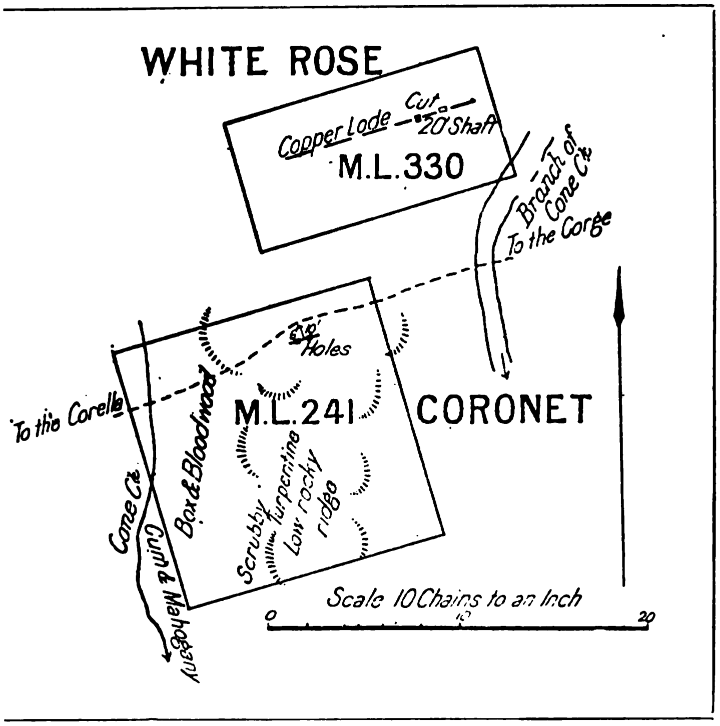
The Coronet (or Cornet) lies, on a branch of Cone Creek, 2¾ miles north of the blast furnace on Mount Start, and only a few chains north of the Violet. The Gorge-Corella road passes across the northern part of the lease.

Its area is 20 ac. and, unlike most others, the lease is square. The ground was deserted during my stay in the locality last October, but is understood to be the property of the Willcocks Cloncurry Development Syndicate.

DEVELOPMENT.

Two holes, 30 ft. apart, have been sunk here: a western, 6 ft.

erly crops, and some very cellular gossan has been found, giving ragement for further sinking.



White Rose (M.L. 330).

Mgr., Allis.

Location, Etc.

he White Rose lies 3 ch. north of the Coronet.

ts area is 10 ac. It had apparently been long idle when visited tober last. The lease has now been taken over on option by the Cloncurry Copper, Limited.

Development.

he workings consist of an opencut, 3 ch. from the eastern lary; and of an inaccessible shaft, 20 ft. deep, 1½ ch. further west.

Output.

1906 ... 11 tons of ore shipped.

Ore-body.

he White Rose crop strikes east 15° north, and its dip is north-westwards.

The opencut exposes promising cupriferous formation, and the shaft has been sunk in ferruginous quartzite and schist, cemented, where jointed or crushed by malachite and limonite, the total width of the formation here being 5 ft. The seconds at grass amount to 6 tons and consist of quartz and schist cemented by malachite and limonite, with a little tile ore, the copper content approximating to 15%, and the silica content, at the same time, being very high.

Abandoned (M.L. ?).

LOCATION, ETC.

This old holding lies ½ mile east of the White Rose, and a few chains north of the Gorge-Corella road.

Its area is not known, all attempts to find either the name or the number of the lease having failed. The ground was deserted during my stay in the locality, and had apparently been long idle.

DEVELOPMENT.

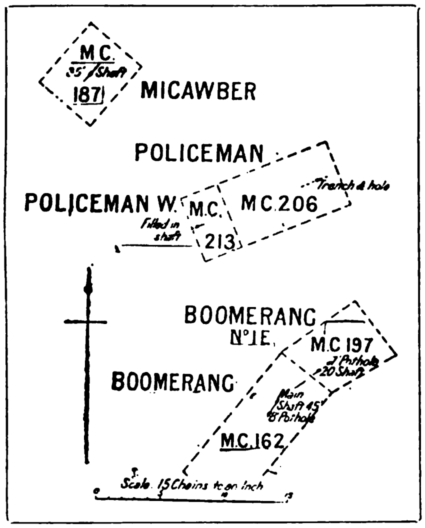
The workings consist of an opencut, 40 ft. long and 4 ft. deep, in the central part of which is an underhand stope, 18 ft. long and 8 ft. deep. A shaft sunk from the bottom of the stope has now caved in.

ORE-BODIES.

The formation worked is believed to be on the line of the White Rose, here also dipping northwards. The country rock is a dense black slate, softened and bleached near the ore, where also slightly schistose, the walls of the ore-body being well defined but showing no sign of extensive movement. The faces of the workings exhibit a formation 9 in. to 12 in. wide and consisting of quartz, limonite,

BOOMERANG GROUP.

The Boomerang Group includes four disconnected crops—the omerang, Policeman and Micawber, and Rainbow, not of any importce except in showing the frequency of crush-zone on Cone Creek.



Boomerang (M.C. 162).

Mgr., Holt.

LOCATION, ETC.

The Boomerang is located on the western side of Cone Creek, mile north of the Daisy, and 2 miles north-north-west of the blast urnace on Mount Start.

Its area is 800 ft. x 350 ft. It was deserted when inspected, aving been under exemption for a short time.

DEVELOPMENT.

The main shaft, 45 ft. deep, is on the western side of the Cone reek dray track; and from it a drive runs east for 10 ft. at 25 ft. elow the surface. A second hole, 8 ft. deep, lies 1 ch. to the southest-by-west.

OUTPUT.

	4 tons	shipped		
1906 ...	2 ,,	,,	carrying	35 % copper
	1 ton	at grass	,,	35 % ,,
	20 ,,	,,	,,	10 % ,,

ORE-BODIES.

A crop of granular barren quartz and cupriferous schist, 5 ft. in idth, runs south 35° west and east 38° north from the main shaft, in which can be seen only lumps of quartz and copper-stained schist, though a 3 ft. bunch of 30 % ore was found at 13 ft. depth. About 2 tons of 35 % ore has been shipped from the main shaft, and 1 ton, estimated to carry between 30 % and 40 % copper, is now in the paddock. This ore consists of intimately associated chalcocite and limonite stained by malachite. The seconds, amounting to 20 tons and averaging 10 % copper comprise malachite, chalcocite, and a little azurite, chiefly in schist with not a large amount of quartz.

Boomerang 1 East (M.C. 197).

Mgr., Blosson.

LOCATION, ETC.

This claim adjoins the Boomerang on the north-east.

Its area is 400 ft. x 350 ft. It was deserted when visited in October last.

DEVELOPMENT.

Two shafts have been sunk: one, 20 ft. deep, lies 4 ch. north-east-by-east from the Boomerang main shaft; and the other, 7 ft. deep, about a chain beyond.

ORE-BODIES.

The Boomerang formation strikes east 38° north in this claim. In the deeper shaft it consists of kaolinised schist quartz and gossan, with very little copper ore near the surface, though promising in appearance. The shallow shaft exposes schist with much quartz, and about 1 ton of 10 % ore (malachite-bearing schist) has been raised from it.

is here a vein 18 in. to 2 ft. 6 in. in width of jointed quartz and dark reddish ferro-calcite, with much fine grained, granular hæmatite and some chrysocolla. The richer ore consists of an intergrowth of chalcocite and tile ore, and of chalcocite and chalcopyrite, the last mineral being found more especially impregnating the cherty silicified ore, in which silica appears to have replaced limonite. About 4 tons of firsts running 20 % copper have been paddocked.

Policeman West (M.C. 213).

Mgr., Brady.

LOCATION, ETC.

This adjoins the Policeman on the west, the workings on the two claims being 10 ch. apart.

Its area is 200 ft. x 350 ft. The ground appears to be abandoned.

A shaft has been sunk alongside the Cone Creek track, but has been filled in again to within 6 ft. of the surface.

OUTPUT.

1905 ... 9 tons shipped by Brady and Allis.

ORE-BODY.

The Policeman crop here strikes east 28° north. At the shaft there is a small lenticular body of quartz, and the chloritic schist adjacent to it is stained by malachite and iron oxides.

Micawber (M.C. 187).

Mgr., Osborne.

LOCATION, ETC.

The Micawber lies 10 ch. north-west of the Policeman, and about 15 ch. south of the Ready Rhino.

Its area is 400 ft. x 350 ft. The claim was under exemption when visited because of the ore in sight being unpayable.

DEVELOPMENT.

One shaft has been sunk between 35 and 40 ft., underlying steeply towards the south-east near the bottom.

OUTPUT.

1906	..	1 ton	shipped	carrying 24 %	copper
		20 ,,	at grass	,, 5 %	,,

ORE-BODIES.

The Micawber crop strikes north 40° east, and underlies steeply to the south-east. It consists of granular quartz, much resembling quartzite, and to the south-west of the shaft it is 4 ft. wide. The greater part of the material raised is quartz, only 2 tons of export quality ore having been obtained. The seconds, amounting to 20 tons, are very siliceous, and carry not more than 5 % copper, as malachite, chiefly, though a little chrysocolla and chalcocite are present also.

Rainbow (M.L. 2454).

Location, Etc.

The Rainbow is situated just to the west of a short range, 2¼ miles north by east from the blast furnace on Mount Start and about a mile west of the Cloncurry-Duck Creek road.

Its area is 40 ac. It was deserted last year, but has lately passed into the hands of the Queensland Copper Freeholds, Ltd.

Literature.

For titles of reports, numbered as below, see Introduction.

(2.) Mr. Jack's report is:

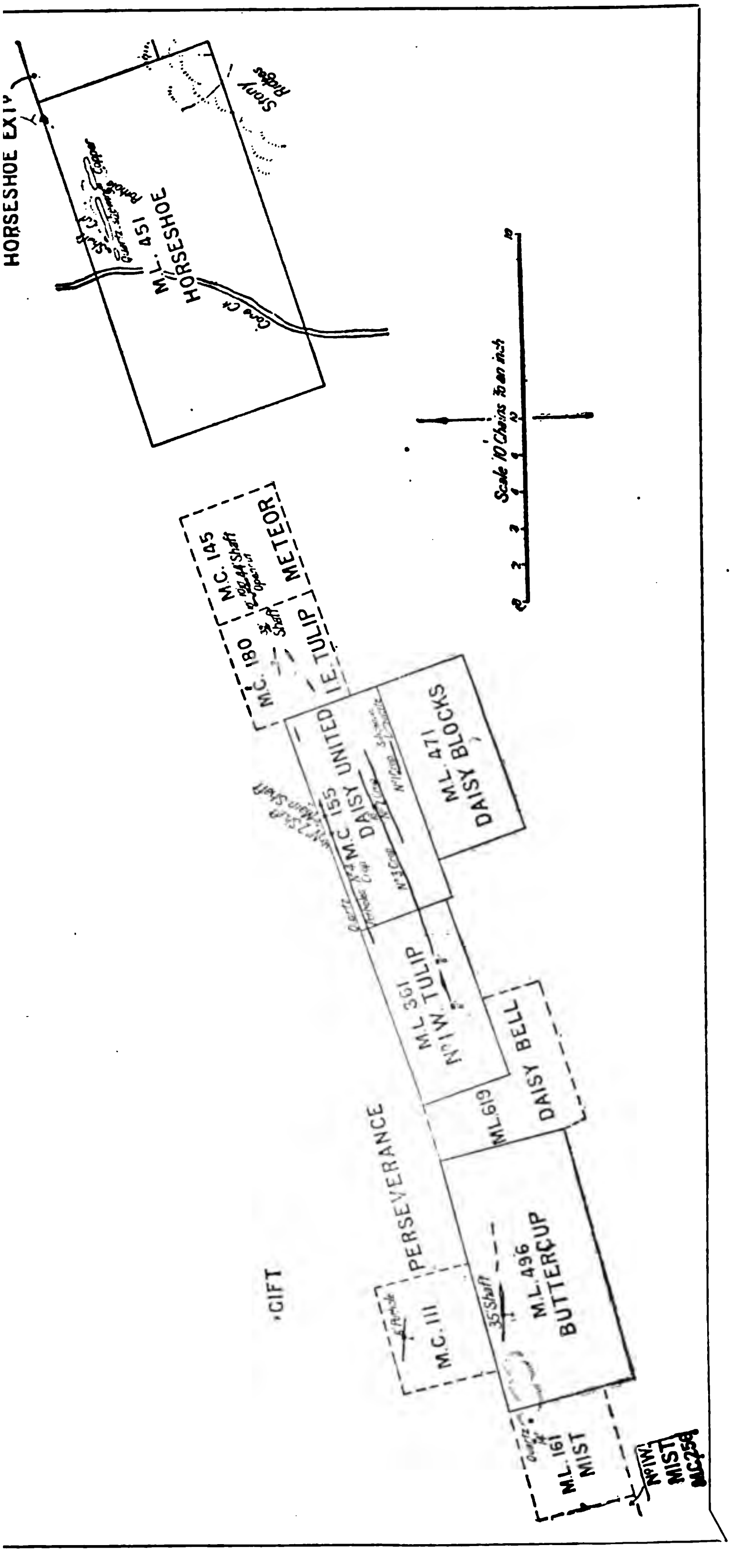
The Rainbow Lode (marked "2454" on the map) lies about three and a-half miles to the south of Selection No. IX., on the fall of Cone Creek, a tributary of Duck Creek. It occurs in flat country, and shows a "blow" (striking WSW. and underlying to SSE.) of green carbonate of copper and gossan. A shaft has been sunk to the depth of 25 feet. The ore now lying at grass came from the bottom of the shaft, and is of very good quality—red oxide and green carbonate of copper (the latter enclosing quartz crystals), and silver-grey copper ore (sulphide of copper and antimony). The lode is traced for over 100 yards. At its west end it is crossed by a quartz reef running NW. and SE., and showing some red oxide of copper and some grey sulphide of copper and antimony. I consider the Rainbow quite a payable mine.

(7.) Mr. Rutherford says:

This consists of an irregular quartz outcrop in schist running east and west for a considerable distance. Associated with the quartz, especially at the eastern end, are green carbonate of copper and iron oxide. A shallow shaft shows that the quartz does not continue in depth. Some good ore is said to have been sent away from the surface diggings.

Development.

Only one shaft, 20 ft. deep, was seen here.


HORSESHOE EXT
M.L. 451
HORSESHOE
Stony Ridges
Cave Ck
Scale 10 Chains to an inch
M.C. 145
METEOR
M.C. 180
I.E. TULIP
Shaft
M.C. 155
DAISY UNITED
Main Shaft
M.L. 471
DAISY BLOCKS
M.L. 361
No 1 W. TULIP
DAISY BELL
M.L. 619
PERSEVERANCE
GIFT
M.L. 496
BUTTERCUP
35 Shaft
M.C. 111
M.L. 161
MIST
Quartz
No 1 W.
MIST
MC 258

Woomera (M.L. 302).

Mgr., Matheson.

LOCATION, ETC.

The Woomera lies 1¼ mile north-by-east of the blast furnace on Mount Start, just to the east of the Cloncurry-Duck Creek road.

Its area is 10 ac. It is the property of the Willcocks Cloncurry Development Syndicate.

One shaft has been sunk in the north-eastern corner of the lease, but is now inaccessible.

ORE-BODY.

The ore-body is believed to strike east and west.

Horseshoe (M.L. 451).

Mgr., Corney.

LOCATION, ETC.

The Horseshoe lies 1¼ miles north of the blast furnace on Mount Start. Cone Creek traverses it from north to south.

Its area is 20 ac. It was under exemption and deserted when visited in October last. The Celestial Copper and Option Company, Ltd., is understood to have since taken it over. The ground was formerly held as a claim and known as the Big Ben.

DEVELOPMENT.

A shaft, now full of water, has been sunk 45 ft., at about 1 ch. east of the creek; 2½ ch. to the east-north-east is a small cut; and

The quartz-veined schist crop continued to the east-north-east for 7 ch., increasing from 20 ft. to 40 ft. in width. Within this area there are two specially prominent crops of quartz, one, 2½ ch. long and 10 ft. wide, beginning 1½ ch. east of Cone Creek, and the other, 2 ch. long and 6 to 8 ft. wide, lying ½ ch. to the east of the first. The former stands out 5 ft. above the schists, and the latter rises 10 ft. above the surrounding flats.

The quartz as usual is practically barren, but occasional bunches of poor ore are found in the adjacent and interlaminated schists, as at the central cut. The eastern pothole exposes only slightly copper-stained schist.

Meteor (M.C. 145).

Mgr., Absolon.

LOCATION, ETC.

The Meteor adjoins the Horseshoe at the north-western corner, and lies ¼ mile north of the Cleopatra.

The area is 400 ft. x 350 ft. The claim was deserted when visited in October.

DEVELOPMENT.

The main shaft, which is 44 ft. deep and underlies 4 in 1 h., is 2 ch. from the western boundary; at 20 ft., 40 ft. and 1½ ch. distance to the west there are potholes, each 10 ft. deep; and an opencut lies 30 ft. east of the last. Sinking in the main shaft is said to have ceased because of the water met with.

OUTPUT.

1904 ...	8 tons	shipped	by Boyd
1905 ...	15 ,,	,,	,, Hardess and Boyd.
Total ...	23* ,,	,,	
	5 ,,	at grass	seconds
	70 ,,	,,	carrying 10 % copper.

ORE-BODIES.

The crop in this claim, part of the Horseshoe-Daisy-Buttercup line, strikes east 20° north underlying 4 in 1 h. to the south, and comprises 10 ft. width of quartz, with included copper-stained and ferruginous schist.

It is understood that copper ore was found in the shaft from the surface to the water-level, which is at the bottom. The ore last raised is quartz-bearing chloritic schist with veins and octahedral crystals† of cupriferous pyrite; and of this there is about 5 tons at grass. The claim-holders are reported to have shipped 4 tons of 25 to 30 % ore (chalcocite and malachite) and tributers 1 ton more of similar quality.

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* Reported total 60 tons shipped, containing 25 to 30 °/₀ copper.

† Sometimes modified by the development of cube faces.

The second pothole to the west is on a small pocket of ore.

The westernmost hole was opened on a body of secondary sulphides 18 in. wide, which apparently has not proved of any extent. There are 70 tons of seconds at grass, which should yield 10 % copper.

Tulip No. 1 East (M.C. 180).

Mgr., Leonard.

Location, Etc.

This adjoins the Daisy United on the east.

Its area is 400 ft. by 350 ft. Deserted.

Development.

One shaft has been sunk, a few chains west of the Meteor workings. It is 39 ft. deep, and has a 40-ft. crosscut north at the bottom, now inaccessible. It had lately been let on tribute.

Ore-bodies.

Three crops occur in this claim on a line running west 35° south, making an acute angle with the Daisy-Meteor line. The crops consist

Development.

One vertical shaft (*a*), 6 ft. x 5 ft. and 18 ft. deep, is located near the centre of the claim.

Three other shafts lie near the middle of the northern boundary, where work is now in progress. The main underlie shaft, 9 ft. x 6 ft., is 78 ft. deep, with stope extending back for 10 ft. from the shaft, between 30 ft. and 50 ft. from the surface; No. 2 underlie shaft, 35 ft. deep, is 1 ch. to the west-north-west and has drives 15 ft. east and west; and a pothole, 7 ft. deep, is 20 ft. to the east-north-east.

Output.

1905 ...	4 tons	shipped	
1906 ...	35 ,,	,, *	
	27 ,,	,,	by Grey and Long
Total ...	66 ,,	,, †	
	100 ,,	at grass,	seconds carrying 15 % copper.

Ore-bodies.

Four parallel outcrops, striking east 20° north, have been found on this claim. No. 1, near the southern boundary and 3 ch. from the south-eastern corner, consists of siliceous limonite, on which no work has yet been done.

No. 2 crop, which is visible for several chains, but is as yet untouched, lies 1½ ch. to the north, and comprises 2 ft. width of quartz and some copper ore.

No. 3 crop is 50 ft. to the north of No. 2, and can be traced through the greater part of the Daisy United into the Tulip West. At the shaft (*a*) is a vein of quartz 3 ft. wide, dipping 80° to the south-south-east in chloritic schist. The quartz has been found to carry a little gold. Bunches of rich but siliceous malachite and cuprite were found in sinking the shaft, but in all only 3 tons, carrying 33½% copper, have been shipped, and the 5% seconds at grass amount to but 1 cwt.

No. 4 crop dips 10 in 1 to the south-south-east. At the surface of the main shaft the formation is 4 ft. wide; at 40 ft. below, it pinches to 3 ft. width; but at 70 ft. below, the lowest accessible, it is 9 ft.; and, in the bottom, is stated to be 12 ft. The walls are well marked and the hanging-wall exhibits occasional horizontal slickensides. Malachite and tile-ore showed at the surface, but below in the shaft much chalcopyrite, intricately veined by chalcocite and assaying up to 45% copper, has been found. Near the bottom, which is believed to be just above the water-level, bunches of powdery secondary sulphides occur in the schists, together with elongated octahedral crystals of pyrite, on each side of a horse of quartz, which came in at 45 ft. below the surface. Of the total width at 70 ft depth 7 ft. consists of quartz, all of which has to be raised. The section exposed in the ends of the shaft is as follows: Adjacent to the footwall 12 in. chalcopyrite and chalcocite bearing formation; 5 ft. quartz with bunches of chalcocite and also of chlorite; 2 ft. quartz with a larger proportion of chalcocite; and 12 in. quartzose formation carrying chalcocite, adjacent to the hanging-wall. In all 80 tons of firsts, assaying from 27 to 35½% copper, have been separated, and 100 tons of seconds, averaging 15% copper, are paddocked at the shaft. The clear profit to the claimholders over all expenses, except mining, has, with copper at £80 per ton, amounted to £16 per ton of ore shipped.

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* One parcel of 20 tons ran 33 %, and yielded a profit of £11 clear of expenses.

† Mr. Gray informed me that a total of 84 tons had been shipped, carrying 27 to 35½ % copper.

The exposures in No. 2 shaft much resemble the above, there being a central body of poor quartz, 3 ft. thick and dipping 5 in 1 h. to the south-south-east, with 3 ft. width of cupriferous formation on the south, and 18 in. width on the north, but much earthy calcareous sinter (locally known as kaline) has been deposited here in the ore-body as well as in the hanging-wall country.

Malachite and tile-ore were got in the upper part of the shaft, but metallic chalcocite (glance) and chalcopyrite are coming in towards the bottom. The western drive is in the hanging-wall formation, which here consists of chloritic schist, strongly impregnated over the whole width of the drive with malachite and glance. The eastern drive is in much more siliceous ore, though just above it in the shaft there is 2 ft. 6 in. width of bagging ore.

The country rock exposed in the workings is schist, but there are

DEVELOPMENT.

The workings comprised two shafts, each 6 ft. deep, at 3 and 5½ ch. respectively from the eastern boundary.

OUTPUT.

$\frac{18}{20}$ tons shipped, containing 40 % copper.

ORE-BODIES.

The No. 3 line of the Daisy United makes several small crops in this lease, and between these the potholes have been opened. The ore now visible is rubbly, and very low in grade.

Daisy Bell (M.L. 619).

Mgr., Connell.

LOCATION, ETC.

The Daisy Bell includes ground left between the Tulip No. 1 West and the Buttercup.

Its area is 4 ac.

One hole has been sunk 6 ft. in rubble.

Buttercup (M.L. 496).

Mgr., Jones.

LOCATION, ETC.

The Buttercup lies 15 ch. west-south-west of the Daisy.

Its area is $9\frac{8}{10}$ ac. It was let under tribute at the time of my visit.

DEVELOPMENT.

The shaft is 5 ch. east of the north-western corner peg. It is 35 ft. deep, and has drives 20 ft. and 15 ft. to the east and west respectively, at the 30 ft. level, a stope above the latter extending to the surface. Work is now in progress here.

OUTPUT.

1906 ...	4 tons	shipped from Buttercup
Total ...	4 ,,	,, *
	30 ,,	at grass, carrying 12 % copper.

ORE-BODIES.

A formation, presumably one of the southern Daisy lines, here striking east and west, is being tested on this lease. The shaft lies on

---

* It is reported that 20 tons of 25 % ore have been shipped, one parcel of 3 tons of 23¾ % ores despatched to South Australia in May, 1906, yielding a profit of £7 per ton, clear of all expense, except mining.

the line of strike of the Daisy main northern zone, which, however, is believed to have bent round and to run 5 ch. to the north of the Buttercup. The formation is schist and quartz, containing bunches and stains of tile-ore, cuprite, and malachite, veined in the lower part of the shaft with glance. In the western drive the rich ore has gradually decreased in quantity, that over 3 ft. width in the face being worth not more than 10% copper, but at the same time being comparatively low in silica. In the face of the eastern drive is exposed: 6 in. copper-stained quartz on the footwall; then, 12 in. schist rich in malachite, cuprite and glance; and then 3 ft. of copper-stained quartz. Some small octahedral crystals of limonite (pseudo-morphous after pyrite ?) were noticed in the richer ore.

The seconds at grass amount to 30 tons and are expected to run from 12 to 15% copper.

The country rock is schist, the footwall in places being slickensided, unlike the hanging-wall, which, however, is well defined. The dip, as all along the line, is to the south.

Mist (M.C. 161).

Mgr., Brady.

LOCATION, ETC.

The Mist adjoins the Buttercup on the west.

Its area is 200 ft. x 350 ft. The ground was unmanned when inspected.

Perseverance (M.C. 111).

Mgr., Church.

LOCATION, ETC.

The Perseverance adjoins the Buttercup on the north.

Its area is 400 ft. x 350 ft. It was deserted in October, and apparently abandoned.

Only one pothole, 6 ft. deep, has been opened—between 5 and 6 ch. north of the Buttercup shaft.

ORE-BODY.

A siliceous crop, 5 ft. thick and 3 ch. long here strikes east and west and is believed to be on the northern crush-zone of the Daisy. The patch of gossan opened is poor in copper, but its apearance warrants some further work here.

LITERATURE.

For title of report, numbered as below, see Introduction.

(8) Mr. Gibb gives the following analysis of ore from the Perseverance (Iron Cross Course), Duck Creek (Government Analyst):—

Copper	=	6·7 %
Silica	=	17·0 %
Iron protoxide	=	61·7 %
Alumina	=	2·6 %
Lime	=	trace
		88·0 %

Gift (M.C. 194).

Mgr., Brady.

LOCATION, ETC.

The Gift lies about 12 ch. north of the Buttercup.

Its area is 200 ft. by 350 ft. It was deserted when inspected.

DEVELOPMENT.

One shaft has been sunk 30 ft.

OUTPUT.

30 tons shipped, carrying 40 % copper.

Unknown (M.C. ?).

Mgr., Dally.

Location, Etc.

This lies about 7 ch. west of the Gift, and 12 ch. north of the Mist.

The claim being deserted, its area could not be ascertained.

A hole has been sunk 7 ft.

Output.

$\frac{1}{8}$ ton shipped carrying 30 % copper (reported).

Ore-body.

The outcrop consists of 3 ft. width of gossany quartz and schist, striking east-north-east.

Thistle (M.C. ?).

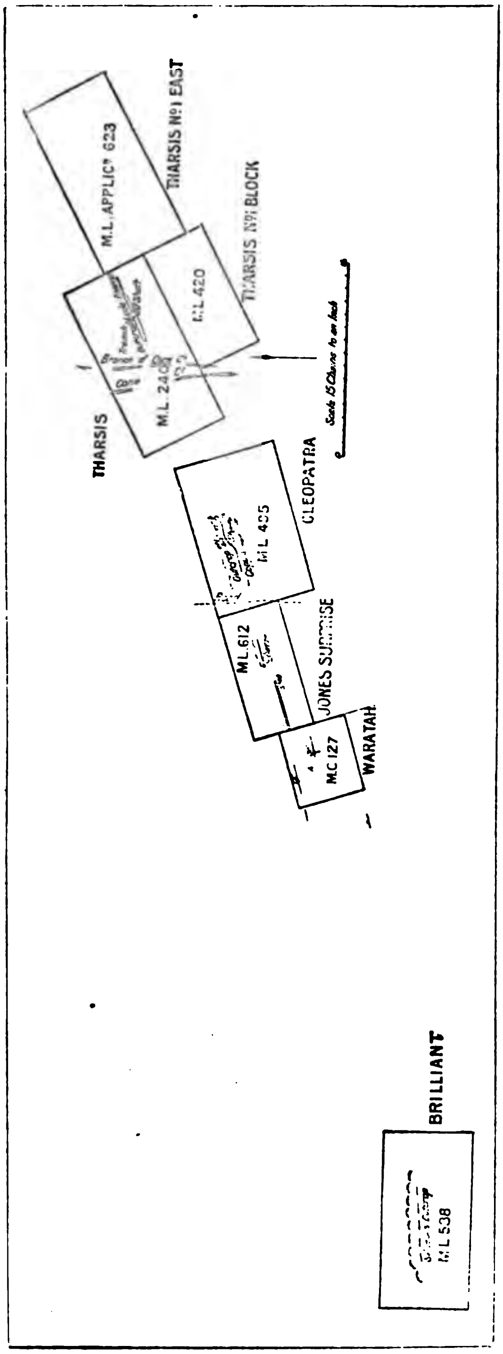
Location, Etc.

This lies ½ mile north-west of the Buttercup.

Its area is not known, the ground being deserted and presumably abandoned, as not on the list of living claims and leases.

Development.

One shaft has been sunk to a depth of 24 ft., and a drive has been opened 4 ft. to the west at the bottom.


THARSIS No. 1 EAST
M.L. APPLICN 623
THARSIS No. 1 BLOCK
M.L. 420
M.L. 2400
THARSIS
CLEOPATRA
M.L. 495
ML.612
JONES SUNRISE
M.C.127
WARATAH
BRILLIANT
M.L. 538
Scale 15 Chains to an Inch

Brilliant (M.L. 588).

Mgr., Staubwasser.

LOCATION, ETC.

The Brilliant lies ½ mile west-south-west of the Waratah, and 1½ mile north-west of the blast furnace on Mount Start.

Its area is 10 ac. The ground was previously held as a claim, under the name of the Jumbo.

DEVELOPMENT.

The workings consist of one inaccessible shaft, 40 ft. deep, and one or two shallow holes 3 ch. from the eastern boundary and 1 ch. from the northern.

OUTPUT.

	2½ tons	shipped	by original prospectors (reported.)
1906 ...	5 ,,	,,	,, Hughes
Total ...	7½ ,,		
	5 ,,	at grass	carrying 10 % copper.

ORE-BODY.

The workings are situated in speckled siliceous schist, 3 ch. east of

a great blow of quartz and quartzite, extending westwards for several chains and having some resemblance to a kneeling elephant. Only 2½ tons of ore have been shipped and 5 tons of seconds now lie at grass. The seconds, of which the copper content is not above 10 %, consist in great part of granular quartz, evidently replacing schist, and cemented by malachite and chrysocolla, with a little limonite, chalcocite and chalcopyrite.

The richest ore is a peculiar intergrowth of chrysocolla and malachite with earthy turgite, the last being in minute irregularly shaped particles, roughly aligned, in a base of the first and second. (Fig. 12). The copper minerals are seen to be in process of replacing chloritic schist, originally separating grains, lumps, and lenses of quartz. Some parts of the ore have suffered extensive silicification subsequently to partial oxidation of the chalcopyrite, that mineral now being often set in a dark siliceous matrix, also cementing white lumps and colourless crystals of quartz.

Waratah (M.L. 127).

Mgr., Wallace.

Location, Etc.

The Waratah lies ½ mile north of the Blue Bell, and a little over 1 mile north-west of the blast furnace on Mount Start.

Its area is 400 ft. x 350 ft. Idle when inspected, most of the work having been done during 1905.

Development.

Two shafts have been sunk, one near the centre of the claim to a depth of 30 ft. (inaccessible) and one 2½ ch. to the north-west, to a depth of 12 ft. Trenches have also been opened for 30 ft. east and west of the first shaft.

Output.

	15 tons	shipped	containing	30 %	copper (reported)
	5 ,,	,,	,,	40 %	,, ,,
Total ...	20 ,,	,,			
	5 ,,	at grass	seconds.		

Ore-bodies.

There are two well-defined parallel lines of outcrop on this lease, striking east-north-east and underlying 5 in 1 h. to the south-south-east. The eastern trench on the southern and larger crop exposes up to 5 ft. width of schist and quartz formation, underlying steeply southwards. It is reported that 15 tons of 30 % ore have been sent away, but the last 5 tons shipped yielded only 25 % copper. The seconds at grass amount to 10 tons, and consist of siliceous malachite, with perhaps 12 % copper.

The northern formation of quartz and crushed schist is 2 ft. 6 in. wide and is on the line of strike of that worked in the Jones' Surprise. There was only a small seam of rich ore, but 5 tons of 40 % ore have been shipped from here; and 5 tons of seconds—siliceous tile-ore and malachite—are at grass.

A third line of formation, which should pass near the southern boundary of the claim, has been tried in a pothole 7 ch. west-southwest of the 30 ft. shaft.

Jones' Surprise (M.L. 612).

Mgr., Jones.

LOCATION, ETC.

The Jones' Surprise is east-north-east of the Waratah, and west of the Cleopatra.

Its area is 5 ac. The lease had only just been taken up, in October last, having been formerly held as a claim by Hardist and Price.

DEVELOPMENT.

Cleopatra (M.L. 495).

Mgr., Johnson.

LOCATION, ETC.

The Cleopatra adjoins the Jones' Surprise on the east-north-east and is separated on the north-east by only 2 ch. from the Tharsis.

The country hereabouts is all flat, worn down.

Its area is 10 ac. The lease was under exemption, and deserted in October last.

DEVELOPMENT.

One shaft, 7 ft. x 4 ft., has been sunk vertically, near the centre of the lease, to a depth of 40 ft.

OUTPUT.

1906	...	$2\frac{4}{20}$ tons	shipped	by H. Johnson
		5 ,,	at grass,	carrying 20 %

ORE-BODIES.

A part of the Tharsis-Waratah crush-zone makes a large crop on this lease, 4½ ch. in length. Just at the shaft it strikes north-east, dipping very steeply to the south-east, but on the east it bends round and runs for 1½ ch. east-north-east towards the Tharsis and on the west runs for 3 ch. west-south-west towards the Jones' Surprise crop. The whole of the sinking was in a formation of jointed quartz lenses separated by crushed country. The quartz contains no copper ore, but flakes of chlorite are plentifully disseminated in parts of it. The interstitial schist is impregnated with limonite, malachite, tile-ore azurite, chrysocolla and very faint splashes of glance. About 5 tons of ore that should carry 20% copper have been picked out and paddocked.

Tharsis (M.L. 240).

Mgr., Matheson.

LOCATION, ETC.

The Tharsis lies 1¼ mile north of the blast furnace on Mount Start, and Cone Creek runs across it from north to south.

Its area is 10 ac. It is the property of the Willcocks Cloncurry Development Syndicate.

DEVELOPMENT.

The workings consist of an almost vertical shaft, 6 ft. x 3 ft., and 50 ft. deep, about 6 ch. south-south-west of the north-eastern corner; deep trench running 20 ft. north of the shaft; and an opencut, 120 ft.

long, 6 to 8 ft. wide and 7 ft. deep at the western end, 2 ch. east-north-east of the shaft. The opencut is being carried westwards from the eastern end of the crop.

OUTPUT.

1906 ...	90 tons	at grass	carrying	12 %
	100 ,,	,,	,,	3 %

ORE-BODIES.

The Tharsis outcrop, which lies 2 ch. east of Cone Creek, is 6 ch. long and 42 ft. in greatest width, in the western part near the shaft, whence it tapers gradually towards the east. The crop rises, as a rounded ridge, 10 ft. above the surrounding flats. Its strike is east-north-east, and its dip is 6 to 7 in 1 h. to the south.

The crop consists of crushed schist, with crowded lenticular veins of quartz, the visible silica amounting to at least 50 % of the whole formation. The quartz has presumably segregated during the production of schistosity in the country rock, and that some of it has replaced country rock is indicated by the smooth partings noticeable throughout the formation, even where wholly of quartz. Some of the quartz is in the form of interlocking crystals and the interspaces are often occupied by a green chloritic mineral, the unreplaced residium of the original country rock. A few of the joints in the outcrop quartz are coated with malachite, but almost the whole of the copper-ore occurs as stains on the laminæ of the schist and as bunches in the same. Some of the bunches visible in the crop northeast of the shaft are 4 ft. in length and 2 ft. across and carry 10 % to 30 % copper, as malachite and tile-ore, but they are often separated by 5 ft. of very low-grade material.

The face of the opencut exposes lenticular masses of quartz and ist dipping 7 in 1 h. to the south. (Fig. 13.) The quartz, which ounts to two-thirds of the whole, carries very little copper, but the erlaminated schists should average 5% copper as malachite. About tons of ore, estimated to carry 12 % copper, have been stacked ngside the cut, the copper occurring chiefly as malachite staining schist, but also to a small extent as tile-ore. The silica content is r 50 %, but iron should reach 10 %. The rejected material from cut should carry 2 % copper.

The trench running north from the shaft exposes similar forma-n, dipping southwards 6 in 1 h. and averaging 7 % copper by the nager's assays.

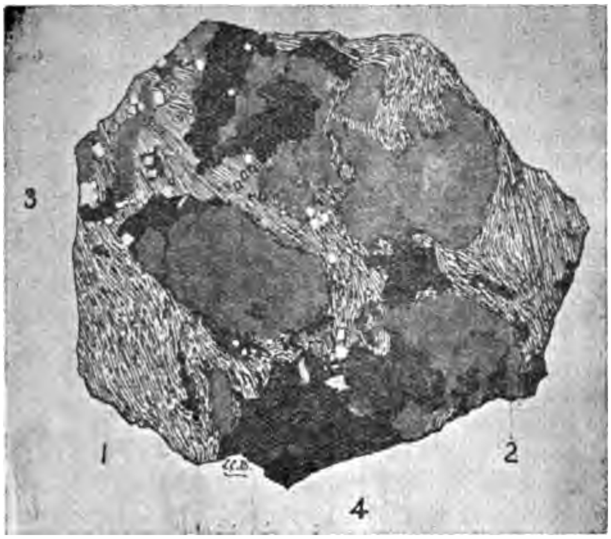


FIG. 14 (NATURAL SIZE).—TYPICAL ORE, 50 FT. LEVEL, THARSIS.

1. Schist *3. Pyrite*
2. Quartz *4. Chalcocite.*

The whole of the shaft is in schist-quartz formation with car-ates in the upper part but with bunches of chalcocite as well towards bottom, where there is one 18 in. in diameter and carrying at st 30 % copper. There is also at the bottom a 9 in. band of red san, with a sprinkling of malachite, making its copper content 2 %, n if tile-ore is absent. Mr. Matheson has estimated from his assays t the whole of the material raised from the shaft should average

8 % copper. **My surface sample from the whole of the dump consists of equal parts of quartz and schist. The quartz is crystalline and barren except for external films of malachite. The schist is chloritic,** is stained throughout by malachite and in places by gossan, and contains a little chalcocite (glance) adjacent to quartz. (Fig. 14.) The following is the result of assay (Government Analyst):—

Copper ... ... = 3·3 %
Gold ... ... = 20 gr. per ton
Silver ... ... = 2 dwt. ,,

The shaft has thus proved that, in one part at least, the formation is no less cupriferous at 50 ft. below than at the surface, and it does not appear to have been sunk in a specially favourable locality. Consequently a large supply of low-grade siliceous ore is to be relied on from this lease.

Tharsis No. 1 East (M.L. 623).

LOCATION, ETC.

This lease adjoins the Tharsis on the east.

Its area is 10 ac. It was deserted in October last, work having not yet commenced.

ORE-BODIES.

There are no crops on this ground.

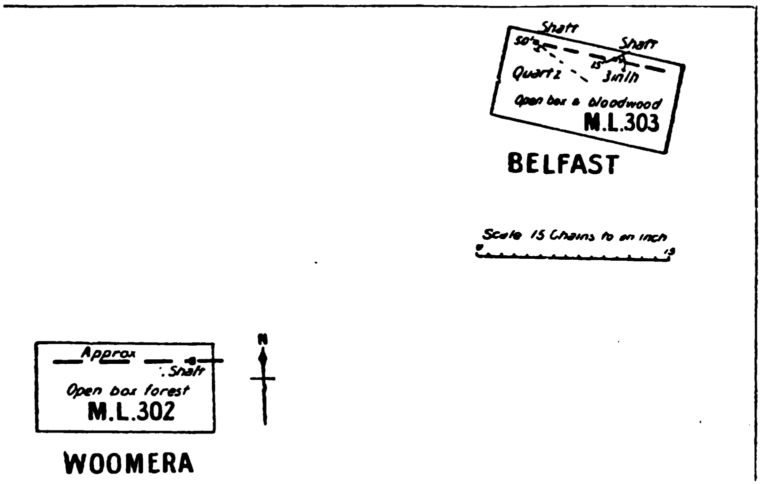
Tharsis No. 1 Block.

Mgr., Corney.

LOCATION, ETC.

This adjoins the Tharsis on the south.

Its area is 5 ac. It was not manned in October last, and work ad. The mine is located in a flat-bottomed valley between a north d south row of worn-down hills, the backbone of a former range,



out a mile to the east and the still less significant Rainbow ridge to e north-west.

Its area is 10 ac. It is the property of the Willcocks Cloncurry evelopment Syndicate, which was opening it up at the time of my sit. Some confusion has arisen concerning the name of this lease, e manager referring to it in his reports as the Alabama.

DEVELOPMENT.

The main shaft is located 2½ ch. south-east of the north-western rner. It is accessible to a depth of 40 ft., where there is a staging d a drive 12 ft. to the north-west, but it is understood to have a total pth of 50 ft.* Another shaft, 15 ft. deep, lies 6 ch. to the east-by-uth.

OUTPUT.

1906 ... 50 tons at grass carrying 15 % copper.

ORE-BODIES.

A few boulders of ironstained quartz and calcite constitute the p at the main shaft. The strike appears to be east 38° south, ards a quartz crop near the centre of the lease, the dip being 2 in to the south-west. The exposure in the main shaft is of a rather erent character to most others on Duck Creek waters, consisting t does of a cavernous formation made up of quartz, calcite and hy gossan, in which chiefly the copper ores occur. The formation he south-eastern end of the shaft is 3 ft. wide, but is not being broken down. In the drive on the opposite side of the shaft a total width of 8 ft. to 10 ft. of formation is being stoped out. Over one-half of it is quartz, and one-quarter cavernous calcite, the remainder being earthy-brown cupriferous limonite, which, besides being found between masses of quartz and limonite, forms a 12 in. band on the hanging-wall and a 6 in. to 18 in. body adjacent to the footwall quartz, the two bands being separated by 5 ft. of irregularly interpenetrating quartz and calcite. Chrysocolla occurs in the limonite, more especially in the calcareous nodules and some irregular bunches of chalcocite have been struck as well as tile-ore, but most of the copper is present as malachite. Most of the quartz contains cupriferous pyrite (perhaps leached chalcopyrite), generally surrounded by limonite. Secondary silica is very plentiful, both crystallised in cavities in the limonite and in amorphous form throughout the oxidised ore, cracks in which are filled with chrysocolla. Micaceous hæmatite is to be seen in bunches in the calcite, and also in thin sheets along the cleavage planes of the same mineral.

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* Subsequently to my inspection some stoping was done above the 40-ft. level.

Some ore has been shipped, but the 50 tons paddocked at the shaft are not expected to run above 15%. My surface sample from this paddock contains: one quarter limonite and turgite with crystals of the original chalcopyrite (in process of alteration into limonite and glance), a little crystalline cuprite, fibrous malachite and coatings of earthy malachite on cracks, besides a little chrysocolla in the less siliceous turgite; one quarter very cellular but rather siliceous gossan, containing a little acicular malachite; one quarter ferruginous granular quartz, with bunches of siliceous gossan and coatings and fillings of chalcocite; fairly pure chalcocite (glance) veined by silica and coated with malachite; slightly ferruginous calcite with some chalco-

PIONEER CHIEF GROUP.

The Pioneer Chief Group is a scattered one, and includes four (possibly five) separate lines, on which are: the Blue Bell, Pioneer Chief and Marabah; the Noontide and Try Again; the Alabama; and the Easter Gift. None of these crops is of any extent.

Pioneer Chief (M.L. 231).

Mgr., Walsh.

LOCATION, ETC.

The Pioneer Chief is situated on the eastern bank of Cone Creek, ½ mile north of the blast furnace on Mount Start. The Cloncurry-Duck Creek road passes close to the workings.

The area is 20 ac. The lease is the property of the firm of Graham and Matheson, who purchased it from Price and Wallis, the prospectors, in May, 1906.

LITERATURE.

For title of report, numbered as below, see Introduction.

(8) Mr. Gibb tabulates the following analyses (Government Analyst):—

(s) Selected for shipment—

Copper ... .. = 28·0
Silica ... ... = 12·2
Iron protoxide ... = 21·0
Alumina ... ... = 1·6
Lime ... ... = 7·5
Sulphur ... ... = 5·7
76·0

Gold = 7 dwt. 19 gr. per ton.
Silver = 1 „ 5 „ „

(r) Rejected from ore raised—

Copper ... ... = 11·8
Silica ... ... = 21·0
Iron protoxide ... = 24·4
Alumina ... ... = 4·0
Lime ... ... = 9·3
Sulphur ... ... = 0·4
70·9

DEVELOPMENT.

The main shaft, vertical to 30 ft. and then underlying 80° for 55 ft., is about 4 ch. south-east from the north-western corner peg. The intention was to sink to 100 ft. and then to block out the ore, there being already a drive 25 ft. to the west at the 50 ft. level.* The water met in sinking has caused much inconvenience, necessitating the installation of a steam pump—10,000 gall. a day being rather too heavy to cope with by baling.

Another shaft, 32 ft. deep, lies ½ ch. east-south-east from the main one; and a pothole is 5 ch. to the north-north-east of the same.

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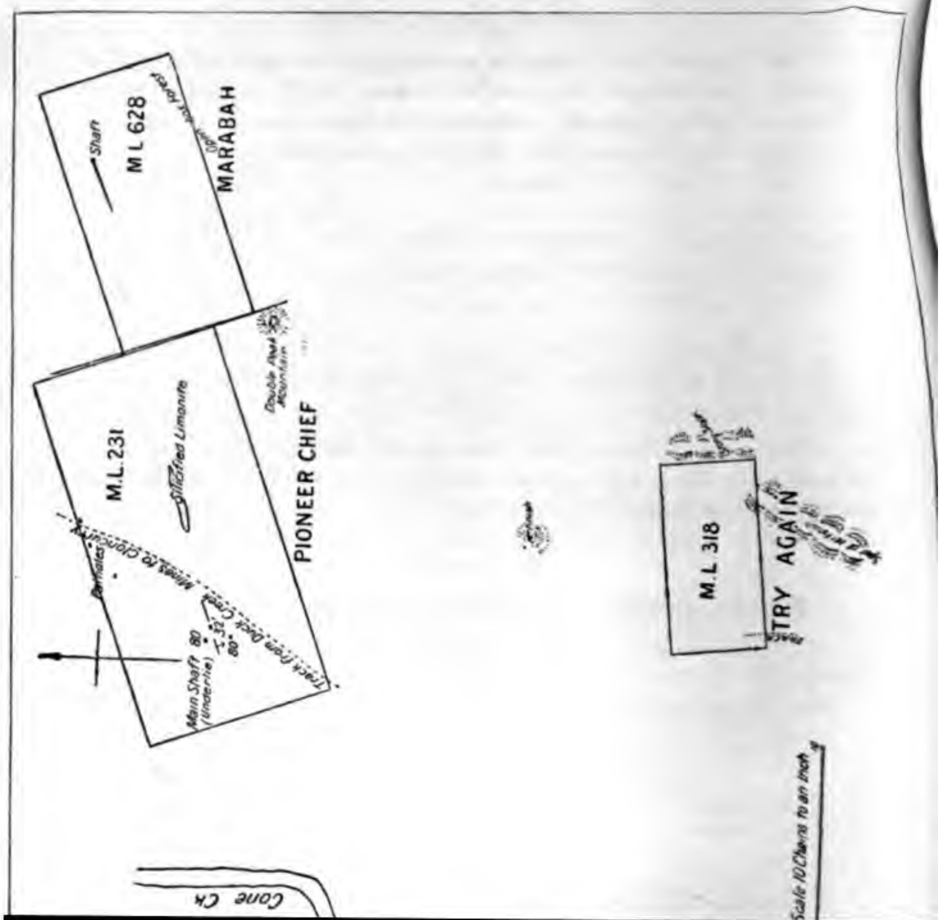
* The warden reported, in Jan., 1907, that the shaft was 115 ft. deep and that at the 104-ft. level drives were carried 20 ft. east and 23 ft. west.


M L 628
Shaft
MARABAH
M.L. 231
Silicified Limonite
PIONEER CHIEF
Double Peak Mountain
Mines to Cloncurry
Main Shaft 80 (underlie)
Track from Duck Creek
M.L. 318
TRY AGAIN
Cone Ck
Scale 10 Chains to an Inch

OUTPUT.

1904	...	$106\frac{18}{20}$	tons shipped	by Price and Wallis
1905	...	5	,,	,,
1906	...	29	,,	,,
		$140\frac{18}{20}$		
		?	,,	at grass (material not sorted).

ORE-BODIES.

The Pioneer Chief ore-bearing zone made little or no show near the main shaft, but 3 ch. to the east there is a barren crop 2 ch. long and up to 10 ft. wide—a crystallised quartz-bearing gossan indurated by a deposition of secondary chalcedonic silica, the quartz crystals now being set in a paste of silicified limonite. This should be tested by driving from the main shaft.

In the main shaft no defined ore-body was met within 20 ft. of the surface, that below dipping 80° to the south. Above the water-level, which is at 50 ft. beneath the surface, the ore was chiefly red clayey gossan and tile-ore, with bunches of chalcopyrite, enriched by chalcocite, but much native copper, in dense reddish gossan with infillings of crystalline calcite, appeared near the water. Mr. Walsh informed me that a small seam of secondary sulphides passed into the footwall at 50 ft., and several other streaks below water-level in the footwall are to be prospected for by cross-cutting. Chalcopyrite and pyrite stained by earthy chalcocite first came in, 3 to 4 ft. wide, at 56 ft. depth, under barren pyrite, seams of which were found on farther sinking overlying rich ore. Pyrite is especially in evidence towards the shaft bottom, where two seams of ore, separated by 2 ft. of country rock, can be seen; the northern one, 5 in. thick is of pyrite, and the southern 6 to 12 in. thick, is of cupriferous pyrite, richer at the eastern than at the western end.

The ore cuts out in the face of the western drive on the 50 ft. level but continues under foot.[*]

The country rock is a granular green slate, showing internal slickensides due to crushing near the hanging wall. In the formation the rock is black and chloritic.

In the northern pothole little copper was found.

The 32 ft. shaft is believed to be on a hanging-wall lode 20 ft. back from that being exploited in the main shaft. This is to be tapped by a crosscut from that shaft at the 100 ft. level. The Warden reported, in January, 1905, that the shaft was being sunk vertically to cut the ore-body at water-level.

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[*] Press reports state that 15 in. of ore was broken down in the western drive at the 104 ft. level, and that a body of ore was struck in the sump at 115 ft. level.

Marabah (M.L. 294).

LOCATION, ETC.

The Marabah adjoins the Pioneer Chief on the east.

Its area is 10 ac. Deserted and not inspected. The ground was first held as the Open Sesame, during 1905.

DEVELOPMENT.

One shaft has been opened to a depth of 22 ft. near the centre of the lease on the line of strike of the Pioneer Chief, here 2 to 3 ft. wide.

OUTPUT.

1904 ... 23 tons shipped by Price from the Open Sesame, etc.

Primrose (Extd. M.C. 267).

Mgr., Long.

LOCATION, ETC.

The Primrose is located on the west-north-western flanks of Mount Finish, between the Pioneer Chief and the blast furnace on Mount Start.

Its area is 1,600 ft. by 350 ft. The ground had been deserted for some time in October last.

DEVELOPMENT.

The main shaft, which is 30 ft. deep, lies 10 ch. south 6° east from the Pioneer Chief; another, 10 ft. deep, lies 1 ch. to the west, and the ground has been scratched for a chain beyond it. Besides these there are old trenches, 5 ch. south-east of the shaft.

Nothing has been proved in the western shaft, which is too far the north.

The trenches to the south-east expose veins of quartz 2 in. to in. thick, in stained speckled schist, with bunches of poor carbonate e but nothing of value.

Try Again (M.L. 318).

Mgr., Matheson.

LOCATION, ETC.

The Try Again lies ¼ mile south of the Pioneer Chief, on the ck from that mine to the blast furnace on Mount Start.

The area is 5 ac. The lease is the property of the Willcocks Clon-rry Development Syndicate, who have, however, done no work on it.

OUTPUT.

1904	...	25 tons shipped.

LITERATURE.

For title of report, numbered as below, see Introduction.

(8) Mr. Gibb's report contains the following analyses (Government nalyst):—

(s) Ore selected for shipment—
Copper ... ... = 36·7 %
Silica ... ... = 6·1
Iron protoxide ... = 23·9
Alumina ... ... = 1·4
Lime ... ... = tr.
68·1

(p) Pyritic ore—
Copper ... ... = 46·6
Silica ... ... = 2·0
Iron protoxide ... = 25·0
Alumina ... ... = 1·1
Sulphur ... ... = 10·1
84·8
Gold = trace
Silver = trace

(r) Rejected ore—
Copper ... ... = 20·9 %
Silica ... ... = 29·4
Iron protoxide ... = 23·4
Alumina ... ... = 4·1
Lime ... ... = 0·4
Sulphur ... ... = 0·7
78·9

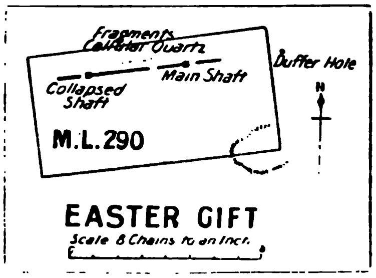
Easter Gift (M.L. 290).

Mgr., Webb.

LOCATION, ETC.

The Eastern Gift lies 1 mile east of the blast furnace on Mount tart, and just to the west of the newly laid out township of Marabah.

The area is 5 ac. Deserted at time of visit, in October, but evidently lately worked.



DEVELOPMENT.

There is a collapsed shaft in the north-western corner of the lease, but the last work was done in a shaft 3 ch. west-south-west of the north-eastern peg. This shaft has been filled to within 15 ft. of the surface, with mullock from a stope at the western end. The only other opening is a trench, on the western boundary, now washed in.

OUTPUT.

1906 ...	6 tons	shipped	reported to carry	40 %	copper
	2 ,,	at grass	carrying	40 %	copper
	15 ,,	,,	,,	20 %	,,
	3 ,,	,,	,,	10 %	,,

ORE-BODIES.

The country rock is the nearest approach to a grey siliceous slate seen on the field. Developments scarcely allow of certainty as to the origin of the ore-bodies but the occurrence of hæmatite is suggestive of regional metamorphism.

Woomera (M.L. 302).

Mgr., Matheson.

LOCATION, ETC.

The Woomera lies 30 ch. north-north-east of the Pioneer Chief.

Its area is 10 ac. It is the property of the Willcocks Cloncurry Development Syndicate, which is, however, doing nothing with it.

One shaft has been sunk in the north-eastern corner, but has caved in.

ORE-BODY.

The ore-body is understood to strike east and west.

Noontide (M.L. 239).

Mgr., Matheson.

LOCATION, ETC.

The Noontide lies 10 ch. west of Cone Creek ½ mile north of Duck Creek, and ½ mile north-west of the blast furnace on Mount Start. The country is very low and flat, being liable to flooding from Cone Creek.

The area of the lease is 20 ac. The lease is the property of the Willcocks Cloncurry Development Syndicate, which, however, is doing no work here.

DEVELOPMENT.

A shaft, No. 1, has been sunk in the north-western corner of the lease to a depth of 22 ft., but, with the stopes, has now collapsed, leaving a cavity 20 ft. long, 10 ft. wide and 12 ft. deep.

Another hole, 15 ft. deep, lies 2 ch. to the west-by-south of this shaft, just outside the present boundary.

A third shaft, 12 ch. to the east-by-south of the first, is 30 ft. deep, and is now partly flooded.

A fourth shaft, originally 40 ft. deep but now fallen in, lies 5½ ch. to the east of the third. Besides these workings, there are several shallow potholes in this, the eastern, part of the lease.

OUTPUT.

		22	tons	shipped	by Sandelin Mac von and Milchurch, containing 15 % copper (Report)
1904	...	17	,,	,,	,, Boyd and Absolon, containing 30 % copper (Report)
1904	...	23$\frac{12}{20}$	,,		(Warden's return)
		62$\frac{12}{20}$			
1906	...	15	,,	at grass	carrying 15 % copper
		5	,,	,,	,, 10 % copper.

LITERATURE.

For title of report, numbered as below, see Introduction.

(8) Mr. Gibbs gives the following analyses (Government Analyst):—

(r) Rejected (three-fourths) from the ore raised—

Copper	11·0 %
Silica	41·8
Iron protoxide	19·6
Alumina	2·2
Lime	4·0
Sulphur	0·6
	79·2

(w) Whole reef—

Copper	24·8
Silica	25·8
Iron protoxide	23·0
Alumina	2·1
Lime	tr.
Sulphur	0·3
	76·0

ORE-BODIES.

The crop between the two western shafts strikes west 13° south, the ore-body dipping 70° to the south by east; between the eastern and western workings its strike is east 7° south; and between the two eastern shafts its strike is east and west.

The ore in the western shaft just outside the lease is siliceous, veined by malachite and impregnated by chalcocite. About 1 ton of 20% ore was got here.

At the western end of the hole on the site of No. 1 shaft, where the country is a granular chloritic schist, a formation of the crushed [redacted]

No. 3 shaft appears to have been sunk on a barren quartz and cupriferous schist formation 3 ft. wide. The 5 tons of ore, stacked at the shaft, are reported to have come from near the surface. It is ferruginous, but also very siliceous, and probably does not carry more than 10% copper. The quartz fragments are set in a dark siliceous matrix impregnated with chalcocite and malachite. This secondary silica is younger than the chalcocite, which it surrounds, but older than the malachite, which occurs crystallised in minute cavities lined by quartz crystals.

No. 4 shaft is reported to have produced 17 tons of 30% ore.

Alabama (M.L. 304).

Mgr., Matheson.

LOCATION, ETC.

The Alabama lies 4 ch. south of the Noontide.

Its area is 5 ac. This is the property of the Willcocks Cloncurry Development Syndicate, which, however, is doing nothing here, the manager's reports published under the heading of Alabama referring to the Belfast.

Two shafts have been sunk near the northern boundary, one near the centre, the other in the north-eastern corner. They have both caved in.

ORE-BODY.

Quartz crops at the surface striking east 5° north.

Blue Bell (M.L. 609).

Mgr., Condon.

LOCATION, ETC.

The Blue Bell is located 5 ch. north of the Noontide.

Its area is 5 ac. The leaseholders were not present at the time of my visit, but had only just knocked off work.

DEVELOPMENT.

One shaft is being sunk, and at the time of my visit was 20 ft. deep. From it an opencut extends 20 ft. to the east.

ORE-BODY.

The strike of the ore-body, which apparently is in a crush-zone, is east 12° north, and the dip is 5 in 1 to the south. It has been traced by shoads for 3 ch. to the east of the shaft, and may possibly yet be proved to be a continuation of the Pioneer Chief.

In the cut near the shaft the body is 12 in. wide, and in the upper part of the shaft it is from 9 in. to 12 in. wide, but in the lower part another stained band is coming in, making the total thickness 2 ft. It comprises gossan, quartz and altered schist, in which occur nodules of mixed chalcocite and tile-ore, up to 9 in. in diameter, together with much sinter, but it is free from included quartz. The ore at grass comprised: 5½ tons bagged and estimated to carry 40 % copper, and 2 tons ready for bagging.

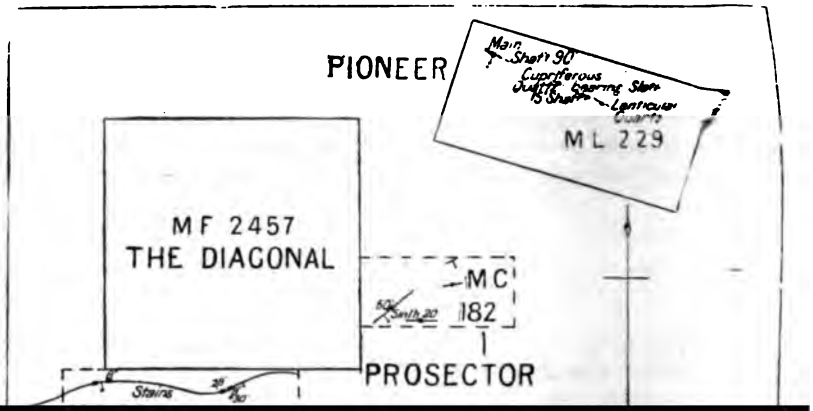
The country rock is a jointed chloritic schist, rendered very schistose along the narrow zone in which the ore occurs.

Output.

1906 ... 7½ tons at grass carrying 40 % copper.

DIAGONAL GROUP.

The Diagonal Group takes in leases and claims surrounding the freehold (2457) and all on distinct ore-bodies making insignificant crops—the Pioneer, Alone Hand, Prospector, and Balfour.



sunk 40 ft. (5 ft. below water level) by the first holders and the syndicate has deepened it to 90 ft.,* the underlie being 6 in 1 h. to the south below a depth of 30 ft.

An open-cut, 15 ft. deep, runs 6 ft. east and 40 ft. west of the shaft.

At 6, 8, 8½ and 9½ ch. east of the shaft potholes have been opened on the line, the second last being 15 ft. deep, and stoped for 10 ft. to the east.

The mine was idle when visited, but a pump had lately arrived on the ground and it was proposed to start work again shortly.†

LITERATURE.

For title of report numbered as below *see* Introduction.

(8) Mr. Gibb's report contains the following analyses (Govt. Analyst):—

(l) Left in reef—		(r) Rejected from ore raised—	
Copper	= 18·9	Copper	= 17·5
Silica	= 33·5	Silica	= 39·1
Iron protoxide ..	= 23·1	Iron protoxide ..	= 19·9
Alumina	= 2·1	Alumina	= 3·9
Lime	= 2.6	Lime	= 0·4
Sulphur	= 0·7	Sulphur	= 0·6
	80·9		81·4

OUTPUT.

1904 ...	26	tons shipped
1906 ...	10	,, ,,
Total	36	,, ,,
	30	,, at grass (Oct., 1906).

ORE-BODY.

The strike of the ore-body by the workings is west 25° north and the dip is southwards. The country rock is chloritic schist, the strike of which in the western end of the open-cut appears to be east-north-east. The hanging-wall country is much slickensided internally, wherefore the ore-body would seem to be on a crush zone.

The ore-body in the main shaft is reported to have averaged 8 to 10 in. in width, but at 30 ft. below the surface a schistose formation is stained and impregnated over a width of 18 in. with malachite and tile ore. The underlie of the shaft below 30 ft. was necessitated by a flat break, the lower part of the ore-body being 6 ft. to the south. Above the water-level (at 35 ft. depth) the ore is chiefly limonite, with tile-ore, malachite and some azurite, quartz being very plentiful, and the copper content 10 to 15%. Below the water-level the chalcopyrite is thinly coated in all crevices by earthy secondary sulphide and the ore raised from the shaft bottom is chalcopyrite with chalcocite, both dull and metallic, the copper content being 40%. There is about 30 tons of ore at grass, which the manager estimated would carry 24% copper. My sample of this consists of schist stained by malachite and iron oxides and carrying some chalcopyrite as well as impregnations of chalcocite, cellular gossan; and limonite with radiating malachite, and impregnations of chalcocite, as shown by its metallic streak, where not otherwise distinguishable. The Government Analyst returns:

---

* The Warden in Jan., '07, gave the depth as 114 ft.

† From Press reports it is learnt that the pump started work in November, 1906, and unwatered the shaft in one day, but the manager makes no mention of any further work done.

Copper ... ... = 18·9 %
Gold ... ... = 1 dwt. 4 gr. per ton
Silver ... ... = 11 ,, ,,

A formation 3 to 4 ft. wide of slate and quartz with tile ore and malachite in the interstices is exposed in the first hole to the east of the shaft. The ore as a whole will not run much above 5% in copper.

In the 15-ft. hole there is 2 ft. 6 in. to 3 ft. of a confused formation, slightly iron-stained and containing occasional spheroidal bunches of glance, up to 6 in. in diameter. The hanging-wall shows slickensides, proving this to be still in the crush-zone. Towards

Two 3-in. bands of gossan and quartz in the foot- and hanging-walls respectively are separated from the main formation by 18 in. and 9 in. of schist. (Fig. 15.)

The easternmost hole apparently was opened on lenticular quartz veins, but some siliceous 10% ore has been raised here.

Alone Hand (M.L. 230).

Mgr., Wilmot.

LOCATION, ETC.

The Alone Hand lies a few chains south-east of the Pioneer.

Its area is 5 ac. It was not visited by me, as it was understood to be abandoned.

DEVELOPMENT.

One shaft has been sunk.

OUTPUT.

1904	...	34	tons shipped, carrying 35 % copper
1905	...	$1\frac{12}{20}$	,, ,, by Wilmot.
Total	...	$35\frac{12}{20}$	,, ,,

Diagonal (M.F. 2457).

LOCATION, ETC.

The Diagonal lies 1 mile west-south-west of the blast furnace on Mount Start, on flat country adjacent to the flood plain of Duck Creek.

The area is 40 ac. The freehold has lately passed from the hands of Mr. A. Coats to the Queensland Copper Freeholds, Ltd. The property was deserted in October last, and, not yet having been re-marked, there was much doubt as to its exact location and extent.

DEVELOPMENT.

The main workings are in about the centre of the freehold. They comprise only potholes and trenches, all in a collapsed state. A number of other potholes were seen, there being several in the north-western corner.

LITERATURE.

For title of report numbered as below *see* Introduction.

(2) Mr. Jack did not inspect the Diagonal, but refers as follows to the selection adjoining it on the west:—

> In the selection numbered 2458 (2 miles W.N.W. of the Chinaman's) I saw two lodes. The first runs west 10 degrees south, is well defined, and about three feet wide, with a dip to south 10 degrees east at 75 degrees. Besides green carbonate of copper and some hæmatite iron ore, a good deal of very fair grey ore is visible. This is a sound payable lode. A second lode parallel to that last described is said to occur in the same selection, but we were too pressed for time to visit it.
>
> A hundred yards to the south, still in the same selection, is a third lode with two quartz reefs running to the S.W. A considerable quantity of green carbonate of copper is visible on the surface of the lode. The country is chlorite slate and greywacke, turned up on end and having a strike to W.S.W.

(7) Mr. Rutherford reports:

> Three quartz outcrops were examined on this area, all running more or less parallel in an east-north-east—west-south-west direction. The middle outcrop can be traced for 50 yds. The quartz is hard and unpromising looking, and lies in schist. From an irregular excavation 18 yds. long on the line of outcrop and 6 ft. deep, 17 tons of rich ore are said to have been removed. An examination of this hole shows that it has contained a lenticular pocket of ore lying in the bedding of the schist and completely cutting out on all sides. Continuing to the west a similar excavation 30 ft. long and 4 ft. deep shows where a second bunch of ore has been removed. The farthest south of the outcrops shows well defined on the surface, but a trench 6 yds. across shows the quartz to be lying on the surface in shallow foldings of the schist. . . . The farthest north of the outcrops shows for a distance of 48 yds. stained in places with green carbonate. . . It is possible that these two outcrops, if further prospected, may be found to contain small pockets of ore similar to those found in the middle outcrop.

ORE-BODIES.

Two main ore-bearing zones have been tried on this freehold, but a number of others are to be seen on which little or no work has been done. The country being flat and covered with quartz rubble, still others may yet be discovered.

The northernmost consists of lenticular quartz-bearing schist, with interstitial malachite, tile-ore and glance, the copper ore in some parts forming bodies 2 ft. thick and at the best averaging 15% copper. It has been traced for a distance of ½ mile, but has been opened only by potholes at irregular intervals, though worthy of a little more attention. The country rock is chloritic schist, of which the strike is east 38° north and the dip 85° to the south-east.

The southern zone can be followed for nearly 20 ch. from the Prospector boundary to the west-south-west, there being quartz crops up to 5 ch. in length and 18 in. to 10 ft. across, between which trenches have proved from 6 in. to 2 ft. of cupriferous gossan, of a promising appearance, more especially towards the west.

OUTPUT.

1906 ... 10 tons in transit, Oct., 38 to 42 % assays.
20 ,, at grass, 30 % copper

ORE-BODIES.

There are four separate outcrops within this claim, none of them striking in quite the same direction, and perhaps representing four separate crush-zones.

That at the main shaft strikes east 40° north dipping 5 in 1 h. to the south-east. Ore can be traced for 25 ft. to the south-west of the main shaft, and gossan and quartz show at the surface for 30 ft. further. In the shaft the ore in the north-eastern end is only 3 in. wide from top to bottom, but varies in thickness between 9 in. and 15 in. in the south-western end, being 20 in. wide at 40 ft. beneath the surface. The body pinches to 2 in. in width in the face of the drive, but is 18 in. wide nearer the shaft and further work may reveal another bunch. The ore consists of dull amorphous chalcocite and the crystalline form known as glance, of malachite, chiefly encrushing, of tile-ore in limonite, gossany in part, and of chalcopyrite, which appeared first in small quantities at 35 ft. below the surface. The amount of quartz is increasing in the lower part of the shaft. The drive exposes gossan with quartz and malachite carrying bunches of chalcocite. A few limy floors or horizontal joints, generally considered specially favourable for the occurrence of rich ore, were noticed in sinking the shaft.

The country rock at the main shaft is schist, that of the footwall being more jointed and less crushed than that of the hanging-wall, but there is a persistent 3 in. band of kaolinised flucan on the former, while flucan is seen only in some places on the hanging-wall, just within which, however, is a polished face. The flucan seems to have influenced the precipitation of the copper ores, more especially the malachite, though, in the face of the drive, the irregular nodules of chalcocite are more abundant adjacent to the footwall flucan than in the gossany formation towards the hanging-wall. The above evidence points to these ore-bodies being on a remarkably well-defined crush zone. There are 8 tons of 30% ore at grass and 3 or 4 tons of 20% seconds.

The pothole 5 ch. east-north-east of the main shaft exposes 18 in. of quartz and limonite running east 10° north. Some copper ore has been taken from here and the indications warrant further sinking. This body may possibly be in the continuation of the zone worked in the main shaft, though off the direct line of strike. The country rock is schist, dipping steeply to the south.

The trenches on the northern boundary are on ore-bodies, striking west-south-west and underlying south-south-east. The ore consists of malachite and tile-ore, and the last lot shipped ran 30%

copper. These bodies are nearly on the line of strike of the crush-zone at the main shaft.

The strike of the ore-body in the southern shaft is west 5° north, and if continued it should intersect the main ore-body within a few chains to the south-west of the deep shaft. It dips steeply to the south. The ore-body is 15 in. wide, but it carries much quartz and all energies are therefore concentrated for the present at the main shaft. The firsts paddocked, 6½ tons, contain 37% copper and the 3 or 4 tons seconds carry 20% copper with 50% silica.

Another crop, not included in any holding, lies 5 ch. south-west of the southern shaft on the Prospector.

Balfour (Extd. M.C. 257).

Mgr., Johnson.

LOCATION, ETC.

The Balfour lies between the Diagonal freehold on the north and the Mountain Maid lease on the south.

The area is 1,200 ft. × 350 ft.

DEVELOPMENT.

The underlie shaft 10 ft. long and 6 ft. wide, 6 ch. from the north-eastern corner and 1½ ch. from the Diagonal boundary, is 28 ft. deep, the inclination being 3 in 1 h.; 20 ft. to the east-north-east is a pothole 9 ft. deep; and 50 ft. to the south-east a vertical shaft has been sunk 30 ft. Two other holes, 1 ch. apart and 8 ft. deep, have hanging-wall near the surface and the same width adjacent to the footwall at the bottom. The dip of the footwall at the bottom is 1 in 1, wherefore, if the walls remain parallel and with this dip, the total width of the formation should be over 15 ft. The country rock is chloritic schist, produced, like the formation, by the crushing due to earth movements. The formation is made up of lenticular bodies of quartz (one, on the footwall at the shaft bottom, is 4 ft. thick), in altered and crushed schist, the last strongly stained by malachite and azurite and carrying bunches of tile-ore and glance, the whole averaging perhaps 10% copper. The silica content is high, but the shaft should be continued, as the gossany nature of the ore is indicative of copper having been leached, and most likely downwards.

There are at grass 2 tons of firsts, my sample of which consists of: schist, replaced by malachite and glance between small quartz lenses; ferruginous kaolin, containing some chalcocite; dense limonite, minutely veined by and impregnated with chalcocite and malachite; chalcocite, with crystalline malachite forming irregular cellular masses; and fairly pure fibrous malachite. The following is the result of assay (Government Analyst):

Copper	=	38·6 %
Gold	=	20 gr. per ton
Silver	=	5 dwt. 14 ,, ,,

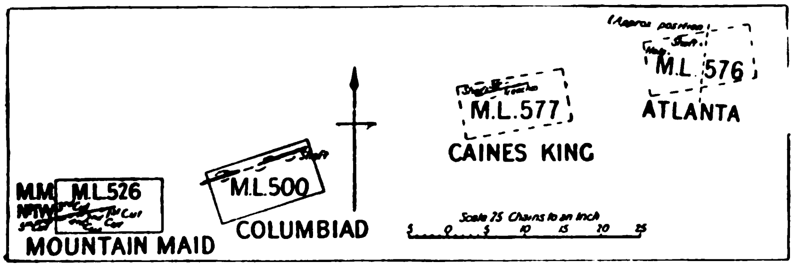
The 5 tons of seconds at grass should average 16% copper, and the whole mullock tip, say 100 tons, will run 2% copper.

The first hole to the west of the main underlie shaft exposes 4 ft. of ferruginous quartz on the footwall, and 3 ft. of malachite and quartz on the hanging-wall, worth sinking on, though apparently contracting in depth. This has produced 1 ton of 36% ore.

In the western hole the formation is still cupriferous, but has pinched down to a few inches. It can, however, be traced to the boundary of the claim, 3 ch. distant, and for several chains beyond.

COLUMBIAD GROUP.

The Columbiad group comprises the Mountain Maid, Mountain Maid West, Columbiad, Caine's King and Atlanta. The leases are on one long crush-zone, marked by strong siliceous crops, over a distance of a mile.



Mountain Maid (M.L. 526).

Mgr., Johnson.

LOCATION, ETC.

The Mountain Maid lies south of the Balfour and 1¼ mile south-west of the blast furnace on Mount Start.

The area is 10 ac. The lease was idle in October last, having lately been placed under option, with the Columbia and Caine's King.

DEVELOPMENT.

The workings comprise four open-cuts. No. 1 cut, 20 ft. long, is near the centre of the lease; No. 2 cut, 20 ft. in length, is 3 ch. to the west; No. 3 cut, only 3 ft. in length, is 10 ft. further west; and No. 4 cut, 6 ft. long, is 1 ch. beyond.

ORE-BODIES.

The Mountain Maid crop, which is about 12 ch. south of the Balfour, is a very prominent one, beginning at 5 ch. from the eastern boundary of this lease and continuing without a break for 2½ ch. into the No. 1 West. The eastern part is 24 ft. across, and rises 6 ft. to 15 ft. above the general level of the ground. The strike is east-north-east and the dip 5 in 1 h. to the south-south-east. Several small patches of chalcocite and malachite have been located near the eastern extremity of the blow, but the outcrop as a whole is not a very kindly one, iron being present in only small amounts.

No. 1 cut exposes, beginning at the east: 5 ft. of decomposed

No. 3 cut, which has only just been commenced on the southern side of the crop, exposes only copper-stained rock.

No. 4 cut, also on the eastern side of the crop, exposes schists with lenticular quartz veins and a 12 in. body of gossan worth sinking on, as likely to improve. The whole 6 ft. visible may average 1% copper.

Mountain Maid No. 1 West (M.L.)

Mgr., Conors.

LOCATION, ETC.

The No. 1 West adjoins the Mountain Maid on the west.

The area is 5 ac. The ground was not manned, being exempt, when inspected in October last.

The only work done is an open-cut, 2½ ch. west of the Mountain Maid boundary. It is 30 ft. in length and 7 ft. deep.

ORE-BODY.

The Mountain Maid crop in this lease rises 15 ft. above the flats. The cut exposes schist, in great part replaced by quartz, leaving only scattered flakes of chlorite. The whole is very poor, the inner 12 ft. of the cut being almost entirely quartzite, but, for 8 ft. to the east of that, schist and quartzite are ironstained in parts and carry a little malachite, averaging perhaps 1% copper.

Columbiad (M.L. 500).

Mgr., Baker.

LOCATION, ETC.

The Columbiad lies a few chains east-north-east of the Mountain Maid.

The area is 10 ac. No one was on the lease when visited in October last, the lease being under exemption.

DEVELOPMENT.

The only excavation of any extent is a trench, 10 ft. long and 2 to 5 ft. deep, on a low hill in the eastern part of the lease. It is intended to sink a shaft 14 ch. to the west.

ORE-BODIES.

The Mountain Maid crop continues into this lease for several chains, when there is a blank and then a crop for 7 ch. again. The crops rise 10 ft. above the ground and crown low hillocks, or ridges, 10 ch. apart, the eastern one having an elevation of 50 ft. above the flats. In the western part of the main crop only one or two small patches of copper ore have been noticed and removed; but on the slope of the hillock, 2½ ch. to the south of the summit, a patch of a few tons of malachite, tile-ore and chalcocite has been found in a ferruginous quartz crop. This should be sunk on, though probably only an isolated bunch.

The trench on the eastern hill is in a quartzite crop 7 ch. long up to 1 ch. wide and rising 10 ft. out of the ground and showing a little gossan in the northern part. The exposure consists of schist, partly ironstained, and quartz, about 18 in. of the latter in the centre of the cut carrying at least 25% glance, and the whole being stained by malachite, so that the full 10 ft. width should average 5% copper. There are at grass 5 tons of ore containing at least 15% copper, and the refuse amounts to an equal quantity. A shaft should be sunk here and cross cuts opened.

Caine's King (M.L. 577).

Mgr., Baker.

LOCATION, ETC.

Caine's King lies about ½ mile east-by-north from the Columbia [illegible], half-way between that lease and Duck Creek.

Its area is 10 ac. It was exempt and deserted when visited in October last.

The eastern crop, which rises 5 ft. above the adjacent flats, is quartz with traces of copper.

At the northern end of the main crop malachite is showing in the quartz; and the trench (*c*) exposes both malachite and azurite with a little chrysoocolla in quartzite, the average grade of which however is low.

Much gossan shows at the surface to the south of this trench, occurring with quartz, in one place over a width of 10 ft. This crop is worth sinking and testing for copper at a depth, from which the whole body could be developed.

The trench (*b*) has been opened on a small patch of malachite-bearing ore of no extent.

Trench (*a*) proved only ferruginous and cupriferous schist.

The shaft is being sunk to meet the lode on the underlie, being 10 ft. below and 15 ft. south of the cap which rises 20 ft. above the neighbouring flats.

Occasional bunches of ore were met and between 2 and 3 tons of 23% ore have been shipped. The 6 tons seconds at grass are made up of schist and quartz with malachite and azurite, and they should average 15% copper.

Atlanta (M.L. 576).

Mgr., Baker.

Location, Etc.

The Atlanta lies $\frac{1}{4}$ mile east of the Caine's King and about $\frac{1}{2}$ mile south-west-by-west of the blast furnace on Mount Start. The workings are alongside the Duck Creek-Boulia road.

Its area is 12 ac. The ground was until lately held as the Keystone (M.C. 253).

Development.

The workings comprise an inaccessible shaft, 20 ft. deep, with a crosscut 4 ft. south $\frac{1}{2}$ ch. west of the road, and a pothole, 4 ft. deep, 3 ch. to the west of the shaft. This work was done by the former claim-holders.

Output.

1904	...	2	tons shipped by Baker
1906	...	$3\frac{3}{20}$	tons ,, ,, Absolon (source doubtful)
		$5\frac{3}{20}$	,,

Ore-bodies.

A quartzose outcrop extends from the road for 4 ch. to the west, and in it are small irregular bodies of tile-ore and malachite, one of which, struck in the shaft, yielded 3½ tons of 40% ore. The ore consisted of glance in quartz stained by malachite, and was accompanied by much sintery lime-magnesia carbonate.

CHINAMAN GROUP.

The Chinaman crush-zone has been traced a distance of 2½ miles and besides the freehold three leases and two claims have been pegged out.

Chinaman (M.F. 2453).

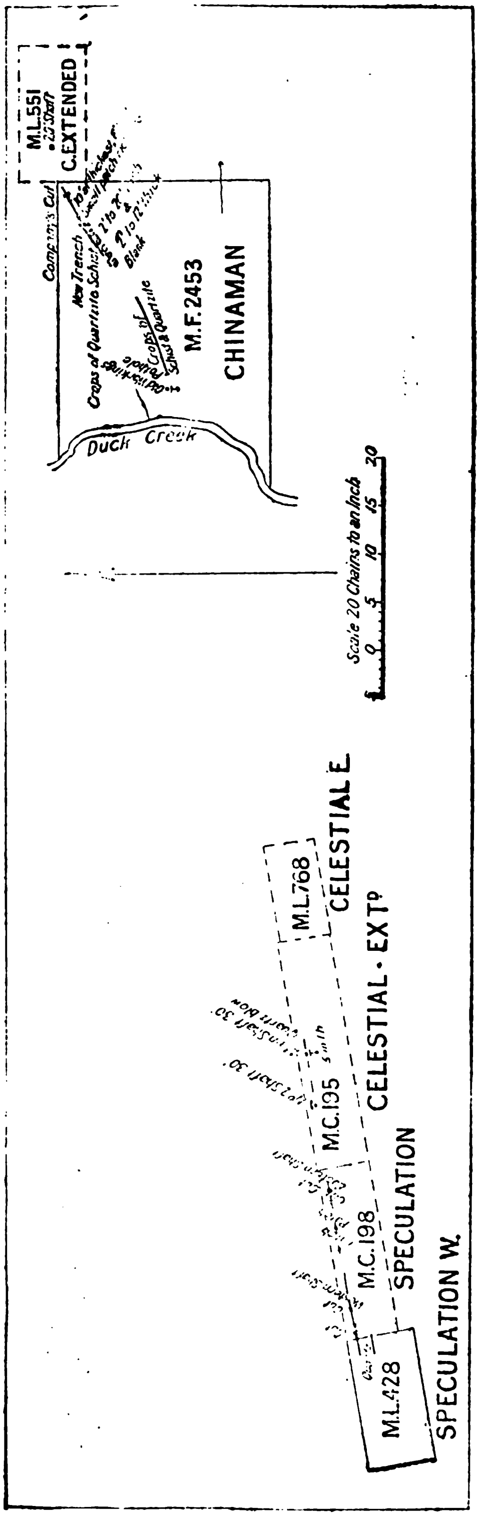
LOCATION, ETC.

The Chinaman freehold lies 1 mile south by east of the blast furnace on Mount Start and extends eastwards from the banks of Duck Creek for 34 ch.

The area of the freehold is 58 ac. At the time of my visit it was deserted, being the property of Messrs. Coats and Robertson. It has now been taken over by the Queensland Copper Freeholds, Ltd.

DEVELOPMENT.

The extreme western workings, which are within 3 ch. of Duck Creek and have collapsed, comprised only shallow shafts. A pothole has been opened at 1½ ch. to the east of them. The company's cut


M.L. 551
C. EXTENDED
Company's Cut
New Trench
Crops of Quartzite Schist
Blank
Crops of Schist & Quartzite
Old Workings
Pothole
M.F. 2453
CHINAMAN
Duck Creek
Scale 20 Chains to an Inch
0
5
10
15
20
M.L. 768
CELESTIAL E.
CELESTIAL · EXTD
M.C. 195
M.C. 198
SPECULATION
SPECULATION W.
M.L. 428

(7) Mr. Rutherford wrote:

> This includes an outcrop of friable quartz, associated with schist rising 15 ft. in places above the level of the surrounding country, and traceable for a distance of 35[illegible] yds. along the bedding of the schists in an irregular north-east and south-west direction. The only work done consists of a trench across the north end of the outcrop. This cutting shows 5 ft. of schist associated with quartz and impregnated with copper carbonate. This band of schist underlies the quartz outcrop from which undoubtedly the copper has been leached. . . .
>
> Following the outcrop to the south it is seen to follow the foldings of the schist with which it is intimately mixed. In places it measures 17 ft. across, while in others it thins down to 3 or 4 ft. It shows carbonate stains in patches all the way along. I consider this to be not a true outcrop, but a deposition along the bedding of the schist of silica carrying copper in solution. This latter has been leached out to a considerable extent and deposited in the underlying schist. There is little doubt that a considerable quantity of impregnated schist such as is lying at grass, could be got from the western side of the outcrop to a depth of 10 to 12 ft., but otherwise I consider the property of little value.

ORE-BODIES.

The Chinaman outcrops extend from the south-western to the north-eastern part of the lease, the general strike being east-north-east and the dip a high angle to the south-south-east. The crops mark areas of silicification and segregation of silica along a crush-zone and their value appears to me to have been much over-estimated presumably owing to the prevalence of green stains of malachite. The zone has not been proved to continue eastwards of the freehold but the Celestial and Speculation (claim) are on its westward extension.

At the western workings a formation of quartz rubble and schist

50% quartz and not more than 3% copper, though many faces are painted a bright green, owing to a small quantity of malachite having leached out. The copper occurs almost entirely in the schist surrounding lenses of quartz. On the second contraction (*d*), which is ½ ch. long, there is much limonite and some malachite. The last bulge (*e*) is 2 ch. in length; in the central part it is 12 ft. wide; and, in the southern part, where 6 ft. wide, it is comparatively rich in malachite.

The new trench is between the northern extremity of this bulge, and another overlapping lens to the east. The copper here also occurs between the laminæ of the schists and in cracks of the quartzite. A small quantity of presumably payable ore has lately been removed.

The crop between the trench and the company's cut, 4 ch. to the east 27° north, rises to a height of 8 ft. and is 10 ft. through at the widest part. It comprises schistose quartzite, with stains and patches of malachite. Two bunches of rich ore have been removed from the southern side of the blow at 1 ch. and 2½ ch. east of the new trench.

The company's cut exposes a footwall of kaolinised slate, dipping 2 in 1 h. to the south. On the footwall is 6 in. barren quartz; next to that is 6 ft. strongly copper-stained schist, with lenses of quartz decreasing downwards in width; then 5 ft. of iron-stained quartzite, increasing downwards; then 18 in. of quartz-bearing gossan also widening downwards; and lastly 6 ft. width of barren quartz and schist. (Fig. 16.) There is stacked at this cut some 40 tons of firsts, chiefly malachite stained schist and quartzite, with lumps of rich ore few and far between It will probably run 10% copper. The seconds, amounting to 3 tons, will not carry more than 3% copper.

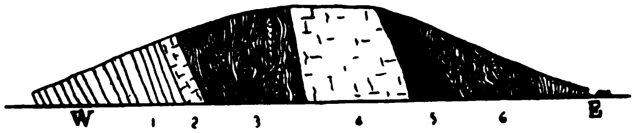


FIG. 16.—SECTION IN COMPANY'S CUT, CHINAMAN.

Scale : 10 ft. to an inch.

1. Kaolinised slate
2. Barren quartz
3. Strongly copper-stained schist with quartz lenses
4. Ironstained quartzite
5. Quartz-bearing gossan
6. Barren quartz and schist.

The crop extends eastwards for only ½ ch. beyond the cut, but another occurs on the line of strike in the adjoining lease.

Chinaman Extended (M.L. 551).

Mgr., Miller.

LOCATION, ETC.

The Chinaman Extended adjoins the freehold on the east.

The area is 10 ac. Deserted when visited.

DEVELOPMENT.

The shaft, which is 20 ft. deep, lies 5 ch. easterly from the Company's cut. It was inaccessible, but is believed to have a crosscut to the south at the bottom.

ORE-BODY.

The shaft is located on the northern side of a small quartz blow, on the line of the Chinaman crops. The material on the dump from the shaft and crosscut is quartzite, with a little schist, both slightly stained by malachite and containing perhaps 2% copper.

To the north of the shaft there is a strong crop of schist, in which are scattered granules of quartz, giving it the appearance of an amygdaloidal volcanic rock.

Celestial (Extended M.C. 195).

Mgr., Ford.

LOCATION, ETC.

The Celestial lies about 2 miles south-south-west of the blast furnace on Mount Start, and 1 mile west-south-west of Duck Creek and the Chinaman freehold.

This is four men's ground—1,600 ft. × 350 ft. It was first held as a mineral selection. Early in this year it was reported to have been over half a mile between this lease and the freehold. Within 10 ft. east of the main shaft the formation is made up in great part of lenticular masses of quartz in schist producing a bold crop, 10 ft. wide and 1½ ch. wide. There being no siliceous crop to the west copper ore may be found in that direction. Besides the cupriferous areas at the shafts, there is a small rich patch of ore ½ ch. west of the main shaft and a poor patch 1½ ch. west, a third body of 15% ore cropping 1 ch. beyond the last.

No. 2 shaft was sunk on the southern side of a small blow. One small bunch of rich malachite-bearing tile-ore was cut in the eastern end of the shaft but most of the sinking was on a schist footwall in slightly cupriferous quartzite with numerous crystal-lined vugs, rather unusual in this district. The crosscut proved 18 in. quartz of no value.

In the upper part of the main shaft a width of 9 ft. of formation, dipping 5 in 1 h. to the south is exposed, between walls of schist. The footwall is well defined, is internally slickensided, and has every appearance of permanency. On the hanging-wall there is 9 in. to 18 in. of quartz, then 6 in. gossany material (*a*) and 2 ft. 6 in. malachite-stained schist, followed by 9 in. to 2 ft. of quartz, then 2 ft. of malachite-stained schist and 18 in. of quartz and gossan (*b*) on the footwall. At the bottom the shaft is contracted in size but, owing to the pinching out of the bands of schist and quartz, both of the gossany veins (*a* and *b*) are exposed. The former is 6 in. wide and consists of 6 in. earthy gossan, well worth sinking on; and the latter of 12 in. of copper-stained quartz.

The formation towards the surface could, without trouble, be picked to run 10% copper, crystallised azurite being fairly plentiful, but practically, the whole of the material raised from the shaft is cupriferous. About 30 tons of quartz, carrying perhaps 2% copper, have been thrown aside from the tip, which now contains about 120 tons. A surface sample of this ore consists of: black chloritic schist, stained by malachite along its laminations; quartz in lenticular form, with an external film of malachite; and cellular gossan and tile-ore, in which are distorted crystals of limonite, pseudomorphous after chalcopyrite, replacing schist. Assay results as follows (Government Analyst):

Copper ... ... = 4·3 %
Gold ... ... = 20 gr. per ton
Silver ... ... = 1 dwt. 10 ,, ,,

A second line on which no work has been done crops about 12 ch. south of the Celestial. About midway between the two lines is a crop running west-south-west of amygdaloidal rock referred to above. (*See* under Commonwealth).

Speculation (M.C. 198).

Mgr., Leonard.

LOCATION, ETC.

The Speculation adjoins the Celestial on the east.

The area is 1,200 ft. × 350 ft. This claim was reported in the Press (16-1-07) to have been taken over, with the Celestial and Horseshoe, by the Celestial Copper and Option Co., Ltd.

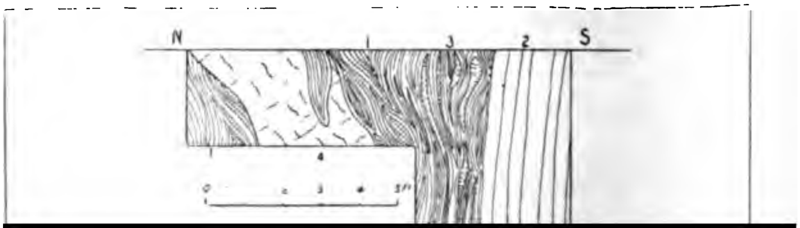
DEVELOPMENT.

The workings comprise a shaft, 15 ft. deep, near the eastern boundary; a shaft 12 ft. long, 5 ft. wide and 10 ft. deep, 3 ch. from the western boundary; a cut ½ ch. west of the first shaft; and two other cuts 2 ch. and 2½ ch. west of the second shaft, 10 ft. and 6 ft. deep respectively.

ORE-BODIES.

The excavations all expose schists and lenticular quartz veins, dipping steeply southwards, and some of them bands of gossan as well.

The eastern shaft gives a good idea of the nature of the crush-



›nes, in which lenticular bodies of quartz occur in schist. (Fig. 17.) 'nly 2 tons of cupriferous quartz and schist, carrying not more than % copper, have been paddocked.

In the adjoining trench to the west the exposure is rather better, ıere being two 6 in. bands of ferruginous schist and formation 'parated by 3 ft. of schist, between the quartz-bearing formation and ıe hanging wall slate. (Fig. 18.) The ore raised from here is very rruginous as well as siliceous and the 6 tons paddocked should yield i% copper.

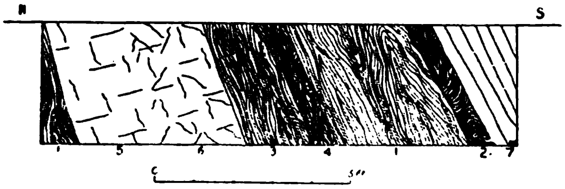


FIG. 18.—SECOND TRENCH, SPECULATION CLAIM.

1. Schist
2. Ferruginous schist
3. Cupriferous schist with quartz lenses
4. Reddish formation
5. Quartz
6. Broken quartz
7. Slate.

The quartz of the crop, just to the west of these workings, :hibits horizontal corrugations resembling slickensides on a large ale, and apparently produced in the country rock during the crushg movement prior to or during the segregation of the quartz.

The only cupriferous crops between the two shafts are at 3 and ch. distance from the eastern. At the former spot a few tons of alachite-bearing schist, carrying 10% copper, have been dug out.

The western shaft exposes a cupriferous formation 12 ft. wide, pping (judging by the footwall schist) 3 in 1 h. to the south. The ction is as follows, beginning at the hanging-wall altered slate: 2 ft. priferous schist and quartz; 2 ft. 6 in. cupriferous quartz; 6 in. priferous gossan; 18 in. poor quartz; 2 ft. 6 in. cupriferous quartz d schist; 18 in. cupriferous quartz. Rejecting the quartz the formaɔn in the shaft appeared likely to bulk over 10% copper as carbone. My sample from the whole length of the eastern face consists crystalline and granular quartz and schist. The granular quartz ntains flakes of schist and is stained by malachite, which also curs in acicular form in cavities with hydrous iron oxides. The hist is also to some extent stained by malachite and hydrous iron ides. The sample was assayed as follows (Government Analyst):

Copper	= 3·0 %
Gold	= trace
Silver	= 2 dwt. per ton.

The first cut to the west of the last shaft exposes 6 ft. cupriferous formation between quartz lenses forming foot- and hanging-walls. It appears likely to average 10% copper. The 10 tons of ore paddocked comprise schist and quartz, with malachite and tile-ore, and are likely to yield 20% copper. This is worth further development.

The westernmost cut exposes 7 ft. width of cupriferous and ferruginous formation, likely to run 5% copper, chiefly as malachite, but there are some films of chrysocolla here also. The hanging-wall is slate, adjacent to it is 12 in. cupriferous schist, and then 12 in. barren schist, then 18 in. cupriferous schist; and adjacent to the footwall schist is 18 in. ferruginous and siliceous gossany schist, worth sinking, at least a shallow shaft on.

There is thus no defined lode here, but rather a crush-zone very siliceous and low in grade in the best parts, the copper being irregularly distributed.

A parallel crop, 7 ch. to the south of the above, has been tried in one place, where there is 2 ft. of quartz with gossan and a little copper ore. A little over 1 ton of 30% ore was shipped from here (by Salveson and Leonard).

Speculation West (M.L. 428).

Mgr., Weir.

LOCATION, ETC.

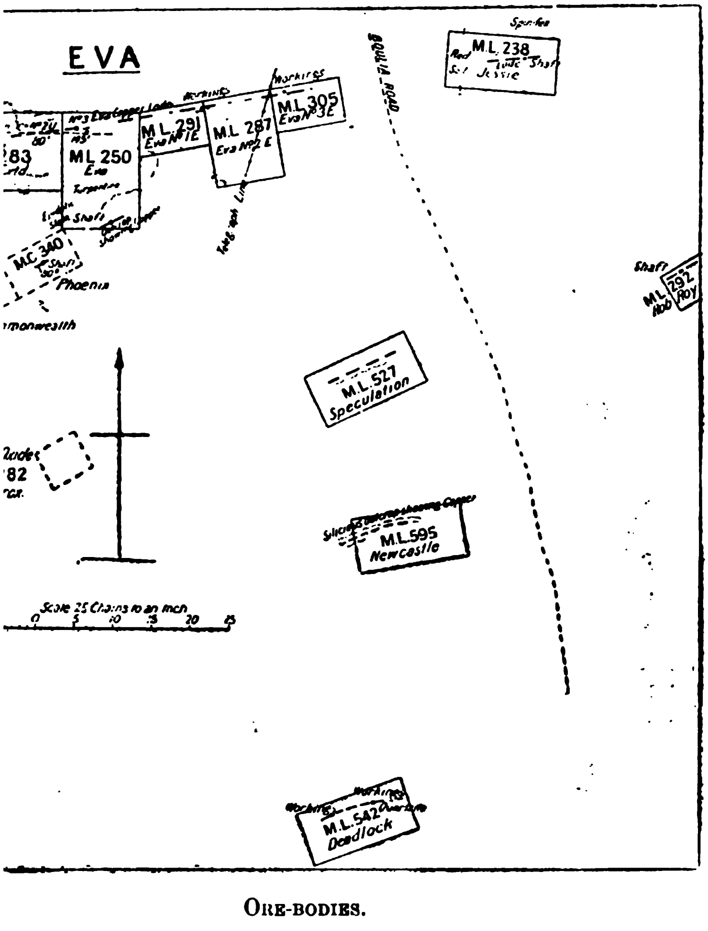
The Speculation West adjoins the Speculation Claim (not the lease) on the west.

The area is $9\frac{8}{10}$ ac. Exempt when visited.

Development.

. 3, the whip-shaft, 8 ft. × 3 ft. in the clear, is 300 ft. to the north. It is vertical to a depth of 120 ft. and below that s with the lode 7 in 1 h. for 25 ft. Water was standing in . below the surface and the ladders having been removed no on could be made. The absence of any quantity of free acid ral matter in solution is to be inferred from the fact that the om this shaft was used for culinary purposes during the late

e only other shaft is near the southern boundary of the lease, r 12 ft. deep, underlying southwards. Since my visit this has epened to 50 ft., where drives have been opened 18 ft. east ft. west.



Ore-bodies.

e northern ore-bearing zone, on the line of which are the s in the Extended and Nos. 1, 2, and 3 East, crops, in the north-eastern corner of this lease, as iron-stained quartz with a little oxide-carbonate ore.

The whip-shaft has proved the lode, below 120 ft. depth, to underlie 70° to the south, the hanging-wall country being blue slate. Mr. Matheson informed me that the lode at the bottom is well defined and larger, but much poorer, than at the surface, there being 4 ft. width of quartz in places.* The ore, of which there are 70 tons paddocked, comprises schist and slate, interlaminated and replaced by quartz and pyrite, with a little tile-ore, azurite and chalcocite. That last raised shows cupreous pyrite in the gossany parts of a quartzose chloritic rock.

A rough sample taken from the surface of the paddock contains: greenish chloritic schist, both barren and cupriferous (malachite); barren crystalline quartz; loosely aggregated crystalline malachite; cellular gossan and limonite with disseminated chalcocite; chalcopyrite interstitial in the quartz; chalcopyrite minutely reticulated with chalcocite; and a little ferruginous granular calcite slightly stained by malachite. The assay return is as follows (Government Analyst):—

Copper	=	13·3 %
Gold	=	1 dwt. 4 gr. per ton
Silver	=	1 ,, 10 ,, ,,

The southern ore-body strikes east-north-east and dips steeply south-south-east. The crop is schist, with lenticular bodies of quartz only slightly stained with malachite and iron oxides. In the shaft the footwall schist is much slickensided internally, but no defined hanging-wall has yet been reached. The ore thus would appear to be in a crush-zone. Near the surface the ore-body was 2 ft. 6 in. wide,

Eva Extended (M.L. 283).

Mgr., Matheson.

LOCATION, ETC.

This lease adjoins the Eva on the west.

The area is 20 ac. It is the property of the Willcocks Cloncurry Development Syndicate.

DEVELOPMENT.

A cut has been opened a few chains from the western boundary; there is a pothole near the centre of the lease; and the main shaft, known as the No. 2, is in the north-eastern corner, 300 ft. from the No. 3 shaft in the Eva. No. 2 shaft, 7 ft. × 3 ft. in the clear was sunk on an underlie of 4 in 1 h. to the south to a depth of 80 ft., and drives were then opened 23 ft. east and west.

ORE-BODIES.

The western cut was opened in quartz and limonite rubble and malachite-stained clay. The bottom cannot now be seen, but between 3 and 4 tons of siliceous ore, carrying tile-ore and malachite, have been stacked here. This ore carries at least 50% silica and only 10% copper.

In No. 2 shaft the average size of the ore-body is 12 in. to a depth of 20 ft., where it pinches to 2 in., gradually increasing again to 18 in. In the end of the eastern drive there is 9 in. gossan and, in the end of the western, 3 in. gossan with some lenses of calcite, both faces being poor in copper but promising in appearance. There is 8 in. width of good ore nearer the shaft on each side. The hanging-wall country is slaty or blocky schist, while the footwall is formed of typical chloritic schist, much slickensided near the ore owing to crushing. Flakes and lenses of the rock are found all through the ore-body, showing that the metallic minerals have been deposited not in an open fissure but rather in a crush-zone.

There are 10 tons of ore at grass from this shaft—comprising schist altered and replaced and containing gossan, malachite and tile-ore—expected to run over 30%. My sample consists of: dark-green chloritic schist, gossany in part and also replaced by tile-ore, malachite and glance stained by malachite; cellular gossan with impregnations of malachite; glance stained by malachite and containing original chalcopyrite; much granular quartzite with chlorite of the original schist; some barren quartz; and a little calcite. The Government Analyst has assayed it for:

Copper ... ... = 20·8 %
Gold ... ... = 1 dwt. 14 gr. per ton
Silver ... ... = 5 ,, ,,

Eva Nos. 1, 2 and 3 East (M.L. 291, etc.).

Mgrs., Hulbert, Entricken and Byrne.

LOCATION, ETC.

These leases have been taken up in order adjoining and to the east-north-east of the Eva.

The No. 1 East (M.L. 291) has an area of 5 ac.; No. 2 East (M.L. 287) has an area of 10 ac.; and No. 3 East (M.L. 305) has an area of 5 ac.

DEVELOPMENT.

The workings on the No. 1 and No. 2 East are on the dividing line and those on the No. 3 East are in the western part. They comprise old shafts and open-cuts, which have been long idle and have collapsed.

ORE-BODIES.

The ore bodies worked appear to be on the continuation of the main Eva crush-zone.

OUTPUT.

1904	..	11	tons shipped by	Brady,	carrying 32⅓ % copper
		6	,, ,,	Woodgate.	,, 35 % ,,
1905	...	8	,, ,,	Brady	
		3$\frac{18}{20}$	,, ,,	Woodgate	
1906	...	3	,, ,,	Wilmot	
		31$\frac{18}{20}$			

Jessie (M.L. 238).

Mgr., Matheson.

LOCATION, ETC.

The Jessie lies ¾ mile east-north-east of the Eva, just beyond the Boulia road. The surface here is a flat rolling peneplain, the soil beyond) and for 10 ft. to the east in schist country. It is formed of limonite and quartz in which malachite stains appear immediately under the surface. There has been a slight deposition of secondary chalcedonic mammilated silica on some of the ore, since its oxidation to limonite, which has also in a few places been rendered cherty.

In the hole is exposed 3 to 6 ft. of quartz, cemented by limonite, some of it gossany and stained by malachite. This ore contains over 50% silica and probably less than 10% copper in the richest parts.

In the shaft sunk since my visit, the manager reports that the ore-body at 12 ft. depth is 3 ft wide and assays 21% copper; and, in sinking 12 ft., 20 tons of 21% ore were raised. At 24 ft. depth it is 2 ft. wide and 10 tons of 33% ore were raised in sinking 12 ft. Between 24 and 36 ft. the sinking was in siliceous ironstone (said to be hæmatite in one report) of no value, but at 44 ft. depth it showed an improvement, and was 4 ft. wide (29-12-'06). To 50 ft. it continued 4 ft. wide but was still low in copper. Rich ore, 25 to 30% copper, was struck in the eastern drive at the 50 ft. level 4 ft. wide, at 24 ft. from the shaft—15 tons of 25% ore were broken down in driving from 14 to 24 ft. and 10 tons of 30% ore in driving from 24 ft. to 30 ft.

At 54 ft. in the shaft there is 2 ft. 6 in. width of ferruginous quartz; and at 58 ft. there is 18 in. siliceous gossan (27-5-'07).

Phœnix (M.C. 340).

Mgr., Walsh.

LOCATION, ETC.

The Phœnix adjoins the Eva on the south-west.

This is three men's ground—600 ft. by 350 ft. It was deserted when visited.

Only one shallow shaft has been opened here.

ORE-BODY.

The ore-body here exposed is on the line of that being proved in the southern shaft on the Eva lease, the strike being east 30° north. In the shaft 3 to 5 ft. width of cupriferous formation can be seen, dipping 80° to the south-south-east. The formation is chloritic schist, with much quartz and impregnated with malachite, tile-ore, and a little chalcocite. About 4 tons of firsts running 10 or 15% copper have been paddocked, the seconds, carrying 5% copper, amounting to 3 tons.

The work done here is of no importance except that it proves the southern crush-zone on the Eva to continue for at least 10 ch. to the west-south-west.

Commonwealth (M.C. 330).

Mgr., Artz.

LOCATION, ETC.

The Commonwealth claim adjoins the Phœnix on the south-west. This is five men's ground, 1,000 ft. × 350 ft.

DEVELOPMENT.

Work had only just commenced here in October last, the first shaft near the centre of the claim being 22 ft. deep, and a start having been made on a second, 1½ ch. to the east-north-east, when visited.

OUTPUT.

1906 ... 4 tons shipped.

ORE-BODY.

The ore-body exposed in the shaft is rather to the north of the line of strike of those in the Phœnix and the southern part of the Eva. Its strike is east 35° north, which would carry it much to the north of the workings on the above line; but its dip is 3 in 1 h. to the south-eastwards.

The ore here is tile-ore, chalcocite (glance) and malachite, with just a trace of chrysocolla. It occurs in the crushed hanging-wall country for 2 ft. from a quartz vein 2 ft. 6 in. thick. No considerable body of ore has yet been found, but there is a possibility of the amount increasing as the quartz pinches out. Only 1 ton of firsts (20% ore) had been bagged, the seconds (10% ore) produced being

DEVELOPMENT.

The holders of the Watercourse opened one trench in 1904. The w shaft, which was only 10 ft. deep when seen, is located below the nk of the creek and likely to be flooded during freshes.

OUTPUT.

1906 ... 3 tons shipped.

ORE-BODY.

The strike of the ore-body is east 33° north, the ore replacing iist in a crush-zone—quite possibly a continuation of the southern a-Phœnix-Commonwealth. The country rock is a blocky slate the nts of which are coated with a white calcareous powder. It forms mooth hanging-wall dipping 3 in 1 h. south-eastwards. East of the rkings the country is a hard dark chloritic slaty rock, with thin iceous bands almost free from chlorite but containing occasional anules of chalcopyrite. It is locally known as diorite.

The formation at the north-eastern end of the shaft is 5 ft. wide, re being 6 in. of quartz, with strong stains of malachite and rite and bunches of tile-ore, on the hanging-wall; then 6 in. high-ade, sometimes nearly pure, chalcocite (glance) ore with quartz; n 9 in. cupriferous (radiating malachite) gossan; then 4 in. chalcite and quartz; then 12 in. chloritic schist and then siliceous priferous (chrysocolla) gossan and gossany quartzite to the foot-ll. In the south-western end a horse of schist splits the ore-body to two legs 2 ft. wide and 4 ft. apart.

There was about 6 tons of unpicked ore at grass, and it may be pected to carry at least 20% copper; the bagged ore—chalcocite, e-ore and malachite with a little quartz—amounts to 1½ tons and ould yield 40% copper.

Huia (Extended M.C. 270).

Mgr., Michail.

LOCATION, ETC.

About ½ mile south-east of the Captain.

The area is 800 ft. × 350 ft. Since abandoned.

One opencut has been excavated here but has now fallen in.

Weka (M.C. ?).

Mgr., Higgie.

LOCATION, ETC.

The Weka lies about ¾ mile south-east of the Captain and ¼ mile orth-west of the Deadlock.

The area is 200 ft. × 350 ft. The ground had not yet been applied for when visited.

Work had just commenced here, only one trench having been opened.

OUTPUT.

1906 ... $\frac{15}{20}$ ton shipped by Higgie.

ORE-BODIES.

The ore-body being opened up is 9 to 12 in. wide and carries malachite, chrysocolla, dioptase (?) and a little atacamite, about 1 ton of such ore being paddocked. The country rock near the ore-body is a blocky schist, almost free from quartz veins. Some radiating black tourmaline was found in the altered sedimentaries ½ ch. south of the cut.

About 15 ch. south-east of the Weka workings there is a cut along a crush-zone running north 30° west, in very ferruginous and rather siliceous copper-bearing material.

WHITE OXIDE GROUP.

The White Oxide appears to be on the continuation of the Speculation and Rob Roy crush-zone, the Newcastle being on a parallel zone to the south.

White Oxide (M.C. 282).

Mgr., Ford.

Speculation (M.L. 527).

Mgr., Miller.

LOCATION, ETC.

The Speculation lies about ½ mile west-south-west of the Rob Roy and the same distance south-east of the Eva.

The area is 10 ac. It was not inspected by me.

ORE-BODY.

The Speculation is on the Rob Roy zone.

Rob Roy (M.L. 292).

Mgr., Sleight.

LOCATION, ETC.

This lease is a little over ¼ mile south-east of the Jessie.

Its area is 5 ac.

Only one shallow shaft has been sunk.

OUTPUT.

1904 ... 22 tons ore shipped, carrying 30 % copper (source doubtful).

ORE-BODY.

A quartz and schist zone strikes east 30° north as on the Eva (south).

Newcastle (M.L. 595).

Mgr., Harvey.

LOCATION, ETC.

The Newcastle lies about 2 miles south-east-by-south of the blast furnace on Mount Start and 10 ch. west of the Boulia road.

The area is 10 ac.

Only one or two potholes have been opened here.

ORE-BODY.

The crop is schist and quartz, with patches carrying malachite, presumably on a shear-zone striking east-south-east, and the same as that being tested on the White Oxide. Very little ore is visible here.

ALICE GROUP.

The Alice, Deadlock, Iron Duke and Mount Surprise are included in one group for convenience in describing, though they have no apparent connection.

Alice (M.L. 717).

Mgr., F. H. Green.

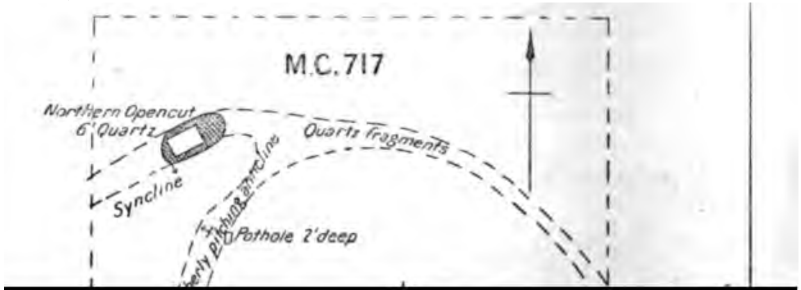
LOCATION, ETC.

The Alice lies 1 mile south 40° east from the Rob Roy, and 1 mile east of the Boulia road, 1½ miles north-east of the Duck Creek crossing.

The area is 20 ac. When visited the ground was held as an extended claim (M.C. 73)—one man's ground. It was first taken up 30 years ago as a mineral selection.

DEVELOPMENT.

The workings comprise: two opencuts, one in the south-western corner being 10 ft. long, 5 ft. wide and in parts 8 ft. deep, the other, in the north-western corner, being 15 ft. by 10 ft. and 4 ft. deep; a



OUTPUT.

1904	...	23	tons shipped by Green (source doubtful).
1905	...	7	,, ,, ,,
1906	...	$7\frac{13}{20}$	,, ,, ,,
	Total	$37\frac{13}{20}$*	

The Wardens have also recorded the following shipments from the adjacent Rainbow claim:

1904	...	6 tons shipped by Laws and King
1906	...	6 ,, ,, King and Davis.

ORE-BODIES.

The greater part of the Alice is underlain by a flatly undulating body of quartz, only the uppermost parts of the anticlines reaching the surface. The underlying rock is a soft grey decomposed slate, the overlying rock, to which the quartz is often "frozen," being kaolinised schist with a coarsely fibrous structure, as in some specimens of petrified wood.

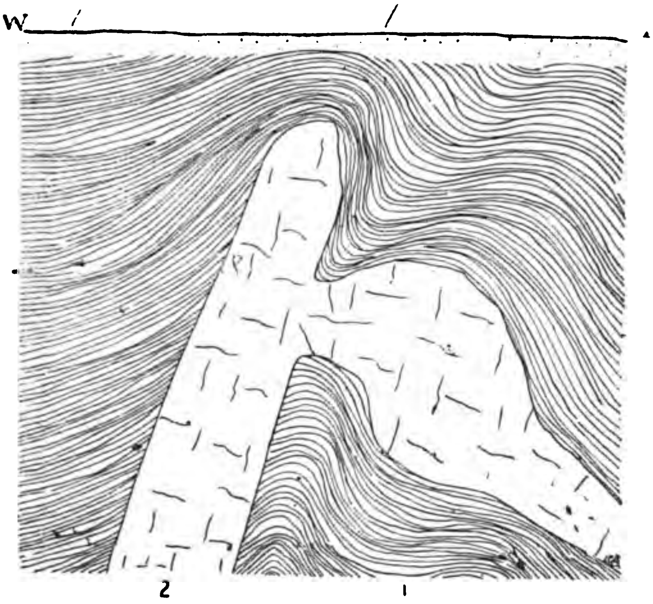


FIG. 19.—SECTION IN END OF NO. 2 TRENCH, ALICE.

Scale: 1 ft. to an inch.

1. Schist | *2. Quartz.*

In the southern opencut the quartz body is almost horizontal, dipping flatly ($\frac{1}{2}$ in 1 h.) east, north and north-west, wherefore the

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[*] Mr. Green informed me he had shipped 25 tons of ore, yielding 35 to 49·7 % copper, and that 5 tons of 40 % ore had been shipped by Brady.

body appears much larger than is actually the case. Bunches of gossan, tile-ore, malachite and chrysocolla—the last two filling in a siliceous skeleton, and the malachite also in radiating masses, up to 3 in. in diameter, encrusted by a thin film of secondary silica or by chrysocolla—are scattered irregularly, through the quartz, more especially about 2 ft. under the hanging-wall. The whole width would average less than 2% copper, but it should be possible to work the malachite-bearing bands apart from the quartz, which was first worked for gold, specks of the metal being often seen in breaking up the stone. There are 2 tons of firsts, containing 40% copper, ready for shipment, besides 1 ton of seconds, containing 30%; and 3 tons of very siliceous thirds, containing 10% copper.

Trench No. 2 exposes a 12 in. quartz vein, which cuts across the strata and yet does not reach the surface, being evidently a spur from the main body. (Fig. 19.)

A 4 ft. vein and spur, with ill-defined walls dipping 3 in 1 h. to the west, are exposed in No. 3 hole. One quarter of this is cellular gossan, with a fair staining of malachite and chrysocolla, and the remainder is quartz. This is one of the best faces seen in the district, and some very good ore is said to have been raised.

The northern opencut shows 6 ft. quartz and cellular gossan. The hanging-wall country is very micaceous and gossany, with malachite near the surface. Some good ore has been also obtained on the footwall. This crop is well worth sinking on, because of the cellular gossan, which is likely to give place to copper-bearing pyrite in depth. About 1½ ton of 36% ore has been shipped from here.

Quartz crystals, up to 3 in. across, with some secondary jasper, line a central cavity in the blow. Malachite-bearing gossan appears at the eastern end of this crop, but has not yet been broken into.

The potholes expose formation similar to, but poorer than, that in the shaft, where it is 3 ft. wide and dips 5 in 1 h. to the south, the strike being east and west. The formation comprises schist and quartz, with malachite and tile-ore, and this material practically forms the whole of the dump. It should not be a difficult matter to raise the copper content in this to 15% by picking out barren quartz. The seconds at grass amount to 10 tons and should yield 20% copper.

Mount Surprise (M.L. 301).

Mgr., King.

LOCATION, ETC.

Mount Surprise lies ¾ mile south-south-east of the Alice, 1 mile east of the Boulia road and 3¾ miles south-east of the blast furnace on Mount Start.

The area is 10 ac. Deserted in October.

No work has yet been done here. The zone could easily be proved by adits, but does not appear to be worth it.

ORE-BODIES.

There is here a north-east and south-west striking crush-zone, somewhat similar to the Tharsis, vertical lenses of quartz and occasional patches of malachite-bearing rock occurring in schist over a width of 30 ft. The strike is north-east and south-west. The siliceous nature of the crop has enabled it to more successfully resist denudation than the surrounding country, and it consequently now rises some 50 ft. above the general level of the plain.

Iron Duke (M.L. ?).

Mgr., Orchard.

LOCATION, ETC.

The Iron Duke is about ½ mile west of Mount Surprise.

The area is (?) ac. The ground had only just been pegged out when visited, and the lease application had not yet been granted.

Two potholes have been opened, 30 ft. apart.

OUTPUT.

Total ... 3 tons shipped by Brady (*fide* Mr. Ford).

ORE-BODIES.

The north-eastern hole exposes a gossany formation 6 in. to 2 ft. wide, dipping 70° to the south-west.

The south-western hole is at the intersection of spurs from the north-east and west with a north-west striking vein of quartz.

There is also a formation, 3 ft. wide, in which are lumps of calcite and copper ore, together with much cellular gossan. This is worth sinking on. The ½ ton of firsts at grass should yield 30% copper. The ½ ton of seconds contains a chalcopyrite mosaic in limonite cementing fragments of crystalline quartz, the oxidised copper having crystallised in cavities as malachite.

A third crop, 1 ch. to the south-west, shows 5 to 6 ft. of quartz with some gossan, but it has not yet been broken into. Its general strike is north-west and south-east, but there are several slight bends.

There is, ½ ch. to the south-west of the last, a fourth parallel crop, on which no work has been done.

TAMBOURINE GROUP.

The Tambourine Group lies midway between the Duck Creek and Corella Groups, and, being on Duck Creek waters, is included with the former. The ore-bodies seen are unimportant in size, and, occurring on bedding planes, are not promising, but their association with the boro-silicate tourmaline is to be noted as being indicative of a deep-seated origin.

Tambourine (R.C. 286).

Mgr., Brockett.

LOCATION, ETC.

The Tambourine is located on one of the head branches of Duck Creek, 26 miles south-west of Cloncurry and 3 miles north of the Duck Creek-Corella road. It is in low open rolling country just to the south of a precipitous range.

included 25 bags of malachite in fine radiating nodular masses, free of visible impurity except silica, which has been deposited as thin coats round the nodules. The 3 tons of seconds at grass probably carry 10% copper, and consist in great part of cellular siliceous gossan in which can be distinguished casts of the original pyrite. Secondary silica is present in some quantity with chrysocolla, and both malachite and azurite are to be seen. The gossan cannot be followed for many yards and most of the copper is therefore probably limited to the one shoot, quartz with little copper occurring on the line to the south-west. The association of tourmaline (schorl) with this quartz is interesting as it is indicative of pneumatolysis having played some part in the genesis of the ore-body. (Cf. the Weka at Duck Creek, etc.) Near the centre of the southern line of the lease there are numerous patches of quartz stained by malachite and containing limonite and tourmaline, the country here being a jointed micaceous slate. Between the main line and these outcrops many bunches of quartz have been located on the bedding planes of the country rock.

Tambourine South (M L. 536).

Mgr., Brockett.

LOCATION, ETC.

This adjoins the Tambourine claim on the south-west.

Its area is 10 ac.

No work has been done on this lease, and it is likely to be surrendered, as no indications of ore-bodies have been found on it.

Banjo (M.L. 590).

Mgr., Smith.

LOCATION, ETC.

The Banjo is located on the northern side of a ravine, in the range ½ mile north of the Tambourine.

Its area is 5 ac.

DEVELOPMENT.

Two shafts have been opened in the north-western part of the lease. The lower shaft is 20 ft. deep, and the upper, which is 25 ft. to the east, is 10 ft. deep.

OUTPUT.

1906 ... 16 tons ore shipped.

ORE-BODIES.

Two parallel ore-bodies, 20 ft. apart, have been exposed here, with a north-east strike and a steep dip to the south-east. The country rock is schist and slate, the general strike of which in the range to the north is north-east and south-west, the apparent dip of the schists being to the north-west, while that of the slates is to the south-east. This is presumably due to induced cleavage, but may be accounted for in some degree by folding.

At the lower shaft slates exhibit a north-and-south cleavage, and the ore-bodies consequently give a false impression of being on a true fissure, although the walls are not well defined. Near the surface only 6 in. of quartz and ferruginous kaolinised slate can now be seen, but chrysocolla was found in some quantity in the upper part of the shaft in one specimen obtained, replacing fibrous malachite and retaining its structure; and pyrite and chalcocite-veined chalcopyrite are showing in the bottom, where the lode is nearly a foot wide. The richly cupriferous shoot is evidently not more than 5 ft. in length. The firsts bagged from this shaft amounted to 10 tons, and the seconds to 2 tons. The former included malachite, chrysocolla, and glance-impregnated chalcopyrite, and the latter carried 5% copper chiefly as chrysocolla.

The upper shaft exposes a vein of copper ore, ½ in. to 3 in. wide, between jointed chloritic schist on the north-west and ferruginous quartzite on the south-east, the latter probably an original bed. On the northern side of the shaft the vein pinches to 1 in. (chiefly chrysocolla), but there is said to be 3 in. width of ore below the mullock in the shaft bottom. The firsts, of which 6 tons have been shipped, carry very finely divided native copper in tile-ore. About 1 ton of seconds—siliceous limonite with chrysocolla malachite and dioptase (?)—are at grass and are believed to carry over 10% copper.

SLATY CREEK.

The ore-bodies seen within the catchment area of Slaty Creek above the Gorge Hotel are, with one or two exceptions, characterised by an east and west strike. The country is highly metamorphosed and the quartz, limestone and copper ore-bodies are typically lenticular in form, being especially well developed on the flat country west of the Two-Mile well, which is itself sunk in highly altered slate veined with quartz and calcite. The limestones may be organically derived and therefore original strata, or may, like the quartz, have segregated during the progress of the metamorphism. The copper ores may also in part have been concentrated from originally cupriferous country, but the pneumatolytic mineral, tourmaline, found on McEvoy's claim with bismutite, points to another source—*i.e.*, a deep-seated igneous magma. As bearing on the general geology of the Slaty Creek, a note should be made of the crystallisation of quartz in ferro-calcite, almost as in graphic granite, about ½ mile south of the Brilliant, somewhat similar to the occurrence at Mount Wheeler. Some trenching has been done here, revealing the presence of a little copper ore.

At the smelter site, to the east of the Gorge Hotel, schists and highly altered saccharoidal limestones are to be seen striking north and south. The schists have lenticular veins of quartz developed in them, and the same mineral occurs crystallised with ferro-calcite and ilmenite.

The ranges, which have a general north and south alignment, are, in great part, built of quartzite and gossan. On the western side of the range, about 1 mile south of the Hotel, much manganese dioxide is developed in slate, striking north-north-west, but exhibiting a well marked slaty cleavage running north-north-east and dipping east-south-east. Again, about ½ mile south-west of the Hotel, is to be seen a well marked west-north-west crop of black siliceous rock, containing scattered crystals of pyrite and magnetite.

As mentioned under topography, this is one of the best localities in which to note the progress of the reduction of the old Cloncurry peneplain. Not only can the former coextension of the mesas and flat topped ridges be imagined, but the general elevation of the conical hills and hogbacks is noticeably similar. The conical hills further form groups, and are plainly due to the dissection of mesas or ridges.

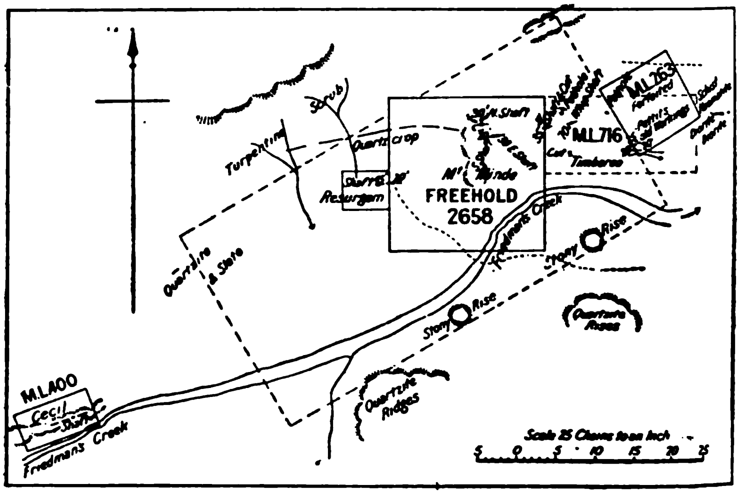
A number of claims on Slaty Creek could not be seen owing to general ignorance as to their exact location.

OUTPUT.

The total output for the years 1903, 1904, 1905, and 1906 is 323 tons of ore of an average tenor of 30% copper.

TIMBEROO GROUP.

The Timberoo group includes holdings in the vicinity of the old Mount Minde Freehold, lying between Slaty Creek and Mount Sheaffe.



Mount Minde (M.F. 2658).

(8) Mr. Gibb has published the following analysis (Government Analyst):—

(r) Rejected from ore raised—

Copper = 18·9
Silica = 10·3
Iron protoxide = 45·7
Alumina = 5·3
Lime = tr.
Sulphur = 0·4
80·6

DEVELOPMENT.

The workings include one trench and four shafts, which, it is understood, were put down during 1904 by a tributer (Purvis). The northern shaft, within 4 ch. of the northern boundary of the freehold, was begun 10 ft. north of a crop, and is vertical for 20 ft., and then underlies northwards for 10 ft. The southern shaft, 2½ ch. to the south-east, is 20 ft. deep, and 10 ft. east of it is the eastern shaft, which is 30 ft. deep, and connected with the former by a drive at 10 ft. depth. The western shaft, 20 ft. deep, is near the western boundary. All these workings, having been so long abandoned, are inaccessible.

OUTPUT.

	Aver. 38 %
1904 ...	24 tons (Purvis), shipped, averaging 38 % copper.
1905 ...	79 „ (Allis).
Total ...	103

ORE-BODIES.

Two separate ore-bodies have here been worked, the northern striking east-north-east (and dipping northwards), and the southern east-by-north (and vertical). Contorted but generally vertical lenticularly quartz-veined schists crop on the hillocks to the west, and chloritic schist has been thrown out of the southern workings.

The cap of the northern ore-body, where exposed over a length of 10 ft. in the trench, is barren quartz and dense limonite, up to 4 ft. in thickness, but pinching to 1 ft. at the western end. The country here is epidotic slate, in which are veins of muscovite rock. Nothing can be seen in the shaft, but about ½ ton of ore—limonite with a little cuprite and malachite and some chalcopyrite, probably running 15% copper—has been left in the paddock. A greenish-white hydromica occurs in aggregates, with occasional quartz crystals in the oxidised ore here.

In the southern shaft, a body of cupriferous gossan, 18 in. wide, is cut out, at 10 ft. below the surface, by a head, dipping 45° to the south. The country is stained by malachite, and should carry 2 to 3% copper over a width of 4 ft. beneath the head, which ought therefore to be followed down. The drive is in rich but siliceous oxide and carbonate.

The eastern shaft also exposes 18 in. of ore (10% copper) between fairly well defined walls. Further development should therefore be undertaken here.

The western shaft is on the line of strike of the Resurgam orebody, but only stains of copper have been found in it.

A large vein of quartz crops in the north-western part of the freehold, and if continued would run into the Timberoo workings, but within 10 ch. of them it ends quite abruptly as towards the west. It stands out like a wall, 5 to 20 ft. wide, for at least 5 ch. to the west 10° south of the freehold, and some fairly rich boulders of copper ore there lie scattered over the surface. For the most part, however, the crop is barren, in only one or two places being strongly ferruginous and slightly cupriferous.

Timberoo (M.L. 716).

Mgr., Matheson.

LOCATION, AREA, ETC.

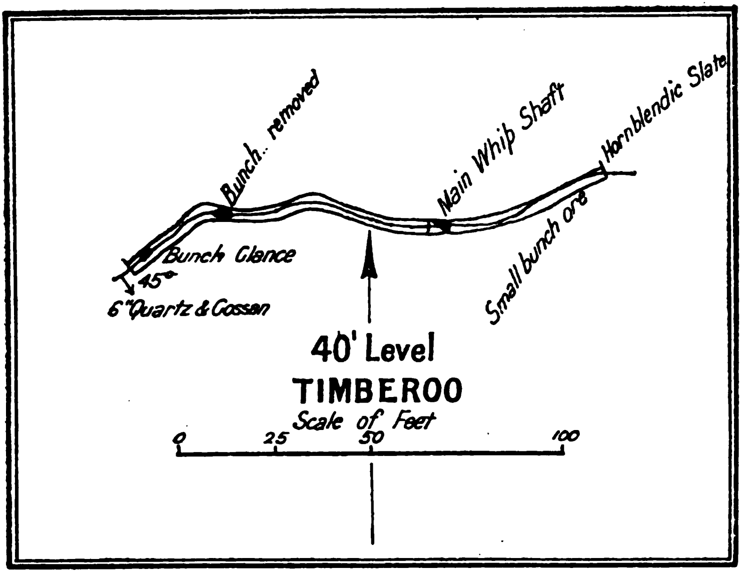
The Timberoo adjoins the Mount Minde freehold on the north-east.

Its area is 20 ac. This lease has been taken up by the Willcocks Cloncurry Development Syndicate, to include the workings on surrendered leases Nos. 200 (surrounding the freehold) and 263 (lying to the north-east) previously worked by Allis and party.

LITERATURE.

(8) Mr. Gibbs gives the following analyses (Government

The western shaft is on the boundary, about 5 ch. from the north-western corner. It is 35 ft. deep, and inaccessible.



The main whip shaft lies 3 ch. to the east. It is 3 ft. 6 in. by 7 ft. in the clear and 54 ft. deep,* further sinking being prevented by influx of water—viz., 1,400 gall. per hour.† On the 45-ft. level crooked drives have been carried 45 ft. eastwards and 65 ft. westwards, and the ground has been stoped out for up to 20 ft. east and from 12 to 20 ft. west of the shaft.‡

Pettit's three old shafts lie 9 ch. east-south-east of the whip shaft. Two are 20 ft. deep and ½ ch. apart; and the third is 25 ft. deep and lies ½ ch. north-east of the first.

The mine had been idle for some time, but three men arrived on the day of my visit to begin work.

Output.

1904	...	78 tons carrying 30% copper
1905	...	24 ,, ,, 50% ,,
1906	...	24 ,, ,, 51% ,,
Total	...	126 ,,

Ore-bodies.

There would appear to be at least three parallel lines here, along which ore-bodies have been located at intervals. These lines have a generally east-north-east strike in both the Mount Minde freehold and the Timberoo lease, and may be continuous through the two, though the ore-bodies are lenticular and limited in their horizontal extent, and those in separate workings appear to have no connection.

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* The Warden reported it to be 90 ft. deep in Jan., 1907.

† This increased to 3,000 gall. per hr. at 63 ft. depth.

‡ A winze has also been sunk 13 ft. (16/3/07) at 30 ft. from the shaft in the western drive 45 ft. level.

The occurrence of diorite to the east of the lease is to be noted, and the crops of hæmatite in the same locality are of importance as evidence that the copper deposits are due to regional metamorphism.

The main shaft itself, being timbered, reveals nothing as to the nature of the ore-body.*

Since my visit a pump has been installed and sinking resumed, and from the manager's reports it is learnt that at 63 ft. from the surface the ore-body became confused and irregular, that from 67 to 72 ft. there was no defined lode, and that "at 73 ft. from the surface the vein of pyritous ore passed into the hanging-wall side of shaft, dipping too flat to follow economically." Sinking was then in chloritic schist, and levels were to be opened at 100 ft. from the surface. The water raised contained free sulphuric acid as well as copper; but the manager told me later that, in the shaft below the 40-ft. level, there is a fine body of glance, 3 ft. wide, and that the last 12 ft. of sinking produced 27 tons of ore, carrying 50% copper, and 3 tons of seconds, carrying 20%. The drives afford an instructive section. In the eastern drive only one small bunch of ore is visible, and the end is in chloritic slate; but the parallel slickensided partings of a shear-zone have been followed in the western drive to the west-north-west, west, and then south-west—any dip which does exist being to the south. On most of these from 1 to 6 in. of gossan is found, and every now and then a bunch, up to 18 in. wide, of high grade chalcocite. Sometimes the parting dies out, and the gossan

The western shaft and opencut seem to be on a separate lens to either the Mount Minde or Timberoo main shafts. The shaft was opened on 15 in. cupriferous gossan running vertically east 10° south, and pinching in the western end of the opencut to 6 in. The country rock is horneblendic schist and slate, that on the tip containing quite 5% of white, sintery lime. There is 10 tons of ore at grass, probably containing 10% copper (as malachite).

Some very fair ore has been raised from the southern opencut, and the 3 tons of seconds at grass—malachite and tile ore in limonite—should yield 20% copper.

The pothole to the north-west of the main shaft exposes a vein of quartz dipping 80° to the south 30° west, in chloritic schist. The quartz is mostly barren, but some bunches of malachite and tile ore in limonite have been broken into.

In the eastern pothole a vein, 2 to 6 in. thick, of gossan, with some tile ore and carbonate, has been found.

Pettit's workings are on small lenticular bodies in quartz, and, from surface indications, are not worth much attention.

The south-western shaft is on a blow of quartz striking east-north-east and vertical or underlying very steeply to the south. The quartz is 2 ft. 6 in. wide at the surface, and increases to 4 ft. in width within 5 ft. of the surface. Only the faintest stains of copper can be seen.

Pettit's south-eastern shaft was sunk in altered speckled rock 5 ft. south of the same crop, where it is slightly cupriferous. Several large blocks of calcite were raised, the mineral presumably being associated with the quartz.

In Pettit's northern shaft a lens of quartz 10 ft. long strikes east-north-east, and at the surface is 12 in. wide, but pinches downwards. Some dense limonite, with a small percentage of malachite, must have come from the lower part of the shaft, and it is understood that some ore has been shipped from here.

Resurgam (M.L. 399).

Mgr., Pettit.

LOCATION, AREA, ETC.

The Resurgam adjoins the Mount Minde Freehold on the west. Its area is 3 ac. This appears to be the Duffer claim.

LITERATURE.

(8) Mr. Gibb gives the following analyses (Government Analyst):—

(r) Rejected (three-fourths) from ore raised—

Copper ... ... = 12·6
Silica ... ... = 51·3
Iron protoxide ... = 15·3
Alumina ... ... = 7·0
Lime ... ... = 9·2
Sulphur ... ... = 0·5
95·9

(s) Selected for shipment—

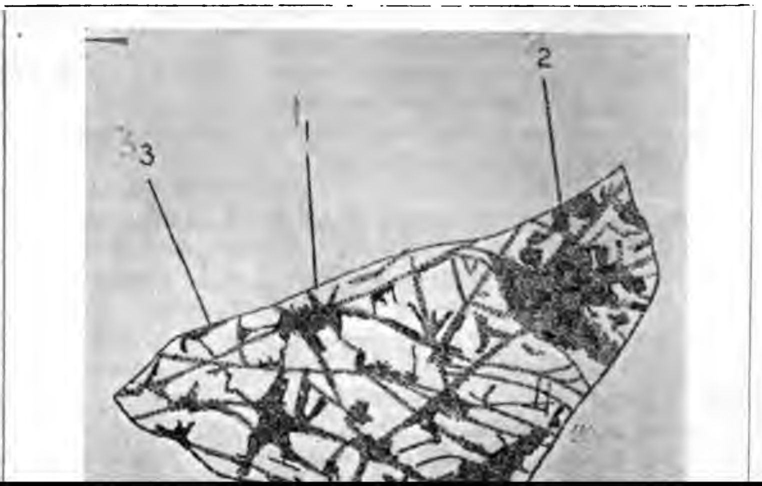
Copper ... ... = 31·5
Silica ... ... = 18·4
Iron protoxide ... = 20·4
Alumina ... ... = 1·5
Lime ... ... = tr.
71·8

DEVELOPMENT.

Much trenching has been done, for no result, to the west of the main workings, where there are two shafts: one, 45 ft. deep, lying 2 ch. south-west of the north-eastern corner, reaching water-level; and another 33 ft. deep, 25 ft. west-south-west of the above. The ground between the two shafts has been stoped out. There was one man on the ground at the time of my visit, but little work has been done during the last twelve months.

OUTPUT.

	100 tons from 45 ft. shaft, aver. 35 to 36% copper (*fide* Mr. Pettit).
1904 ...	51 tons (Duffer)
Total	151 tons.



In the southern shaft lumps of glance have been found irregularly attered through a limy formation over a width of 6 ft. north of the aft, but the present faces are barren. One specimen obtained shows ainly the alteration of chalcopyrite into limonite and glance. The alcopyrite appears to have cracked in all directions, allowing of the rmation of thin films of limonite, and subsequently the isolated articles of chalcopyrite have been replaced by chalcocite to a greater less extent. (See Fig. 20.)

Cecil (M.L. 400)

Mgr., Lobeston.

LOCATION, AREA, ETC.

The Cecil is ½ mile west-south-west of the Mount Minde.

Its area is 5 ac. Not visited.

One shaft is shown on surveyor's plan.

Marguerite (M.C. 151).

Mgr., Grenier.

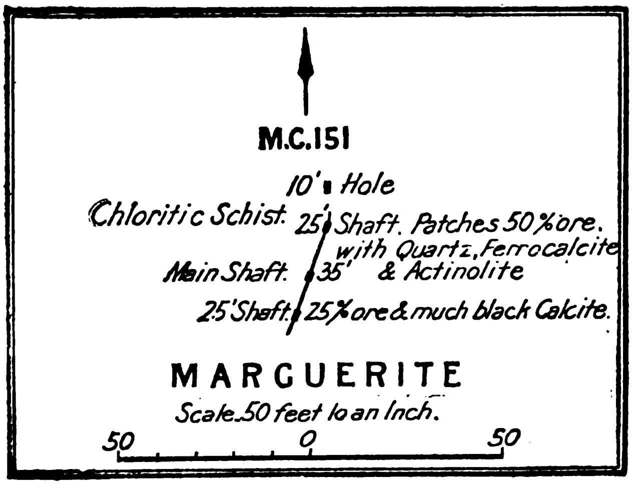
LOCATION, AREA, ETC.

The Marguerite lies about 1 mile south of the Mount Minde free-ld.

Its area is 200 ft. × 350 ft. Apparently abandoned.

DEVELOPMENT.

The main workings, at the northern end, comprise three shafts id a pothole, the last being at the extreme north and only 10 ft. deep. shaft, 10 ft. to the south of the pothole, is 25 ft. deep (inaccessible);) ft. beyond is the main shaft, 35 ft. deep; and another 25 ft. deep, id inaccessible, lies 10 ft. further south. To the south outside of the aim and 5 ch. distant is a trench, and 2½ ch. beyond it is a hole, 5 ft. ep, 1 ch. south-south-east of which is a 10 ft. shaft.


M.C.151
10' Hole
Chloritic Schist
25' Shaft. Patches 50% ore.
with Quartz, Ferrocalcite
Main Shaft
35' & Actinolite
25' Shaft
25% ore & much black Calcite.
MARGUERITE
Scale 50 feet to an Inch.
50
0
50

OUTPUT.

1904	...	3½	tons (Grenier), shipped
06	...	8½	„ („), „
Total		12	„ „

ORE-BODIES.

There are here three detached outcrops, which, though lying on a north and south line, are parallel and probably on distinct zones, striking north 5° east, and dipping 10 in 1 h. to the west.

The crop at the main shaft consists of bunches of cellular gossan, 6 in. wide, but at the bottom there is a body of limonite, 15 in. wide at the southern end and 6 in. wide at the northern, with walls not slickensided but well defined. This is most promising, and sinking should be continued.

The northern shaft is in chloritic schist country, carrying bunches of 40 to 50% ore associated with quartz and ferro-calcite, both of which are pierced by long thin needles of black tourmaline.

In the southern shaft much black calcite was met, besides which some 25% ore is reported to have been shipped.

The 5 ft. hole to the south exposes 2 ft. 6 in. of cellular bluish gossan—almost certainly leached copper ore—dipping 70° to the west-north-west in laminated country. The pothole to the south of this proved only schists, being too far to the east, but the trench to the north shows quartz strongly stained by malachite.

This claim is on the line of strike of the Brilliant crop, the only other striking north and south in the Slaty Creek catchment.

Ore-body.

The shaft was sunk on calcite, ferro-calcite, and limonite, with occasional small bunches of chalcopyrite, especially on the eastern side of the shaft. The ore-body, which in the shaft is 2 ft. thick in one place, appears to pinch out in the sump. It strikes east 10° north, dipping 80° to the south. The country rock is clay schist, the footwall being much indurated.

Unnamed (M.C. ?).

Mgr., McEvoy.

Location, Etc.

This abandoned claim is about ¼ mile west-south-west of the Two Mile well on the Gorge-Duck Creek road, and about 2 miles east of the Mount Minde freehold.

Only trenches have been opened here.

Ore-bodies.

The ore-bodies here are of little economic import, but the mineralogical associations are most interesting. Chalcopyrite has been found in small quantities with stains of malachite, and set in the former are crystals of quartz pierced by radiating needles of tourmaline. Mr. McEvoy here found one small patch—in all about 4 lb. in weight—of bismutite, a specimen of which given me is light-green in colour, is coated with red clayey gossan, and encloses crystals of quartz.

Brilliant (M.C. 159).

Mgr., Savage.

Location, Area, Etc.

The Brilliant lies about 2 miles south of the Mount Minde freehold, and 1½ mile north-west of the Two Mile well.

The area is 400 ft. × 350 ft. Apparently abandoned.

Development.

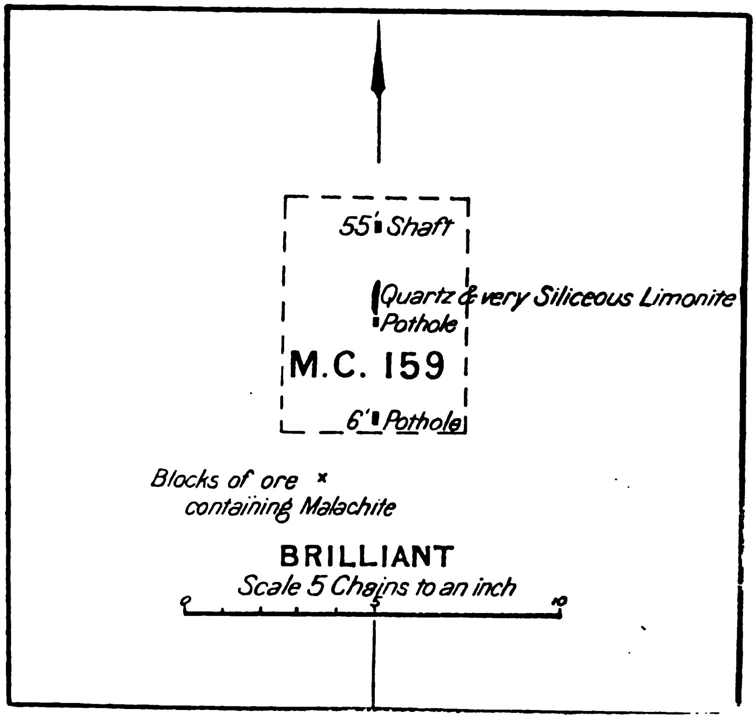
The main shaft, at the northern end, is 55 ft. deep. At the 45-ft. level a drive runs 20 ft. north, and a monkey shaft at the end, 10 ft. deep, has been filled in. The only other workings are two potholes 2½ and 5 ch. to the south.

Output.

40 tons shipped, carrying 26 to 32% (*fide* Mr. McEvoy).

Ore-bodies.

As mentioned, this and the Marguerite are the only north- and south-striking ore-bodies in the Slaty Creek district, and are perhaps on the one line, though there are no intermediate workings. The country rock is chloritic schist.


55' Shaft
Quartz & very Siliceous Limonite
Pothole
M.C. 159
6' Pothole
Blocks of ore containing Malachite
BRILLIANT
Scale 5 Chains to an inch
0
10

The main outcrop of quartz and siliceous limonite is over a chain south of the shaft, and no work has been done on it, though two bags of medium-grade ore were got from the pothole at the southern end. The southern pothole exposes cellular gossan 18 in. wide and

The character of the walls, which are in places 5 ft. apart, is not unpromising for permanence in depth, and the nature of the ore is strongly indicative of there being much richer copper ore below the present workings.

Unknown (M.L. ?).

Mgr., Allis.

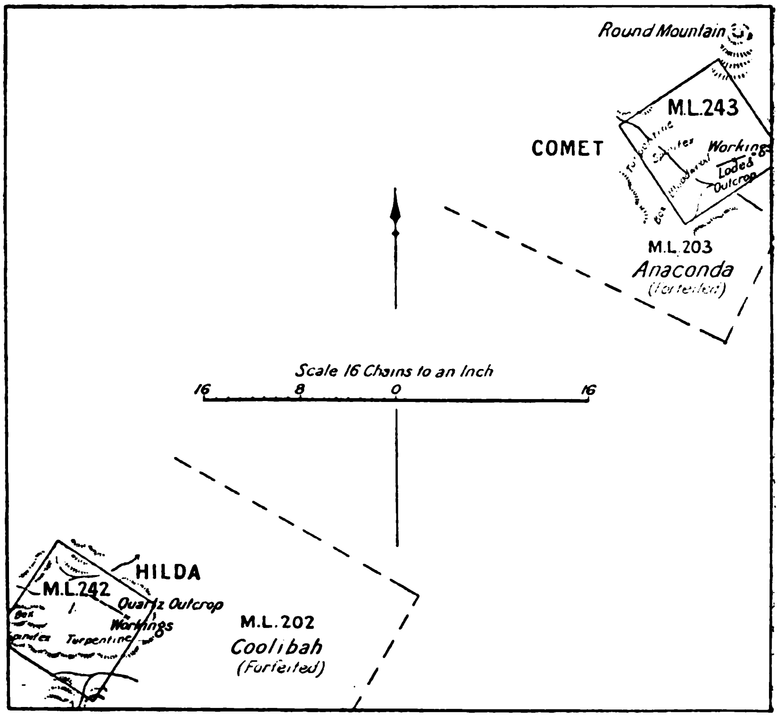
LOCATION, AREA, ETC.

This lies ½ mile south-west of the Gorge Hotel, which is 16½ miles south-west-by-south of Cloncurry.

Several potholes have been opened at some time in the past.

ORE-BODIES.

The potholes lie on an east and west line, and, in the easternmost, the ore body is seen to dip 80° to the south. The eastern cut is in a bunch of siliceous copper-bearing iron ore, 10 ft. in length and 2 ft. 6 in. in total width. Of this the half on the hanging-wall is chiefly flaky hæmatite (specularite) and limonite, but the hanging-wall half of the lode may run 20% copper.



HILDA GROUP.

The Hilda Group takes in the few scattered holdings on the southern branch of Slaty Creek, followed by the Boulia road.

Comet (M.L. 243).

Mgr., Matheson.

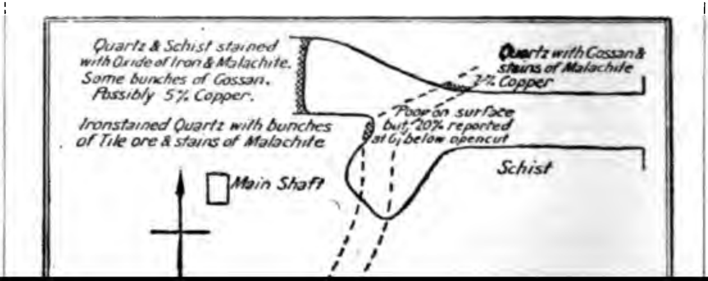
LOCATION, AREA, ETC.

The Comet is 20 miles south-west-by-south of Cloncurry, and about ½ mile west of the Boulia road, 3 miles from the Gorge Hotel.

Its area is 10 ac. This is part of a forfeited lease known as the Anaconda. It is now the property of the Willcocks Cloncurry Development Syndicate.

DEVELOPMENT.

The main excavation is an open cut, 6 to 8 ft. wide, 2½ ch. west of the eastern corner of the lease; it runs 35 ft. west and 7 ft. from the end there is a branch, 10 ft. long, to the south-west.


Quartz & Schist stained with Oxide of Iron & Malachite. Some bunches of Gossan. Possibly 5% Copper.
Quartz with Gossan & stains of Malachite 3½% Copper
Poor on surface but 20% reported at 6' below opencut
Ironstained Quartz with bunches of Tile ore & stains of Malachite
Main Shaft
Schist

opencut there is 8 ft. width of schist and quartz, stained by iron oxides and malachite, and carrying some bunches of gossan. Over the whole width it should average at least 5% copper. Another body of richer ore comes in from the north-east, and has been followed in the south-western branch of the cut. On the northern side of the cut it is 2 ft. wide, and consists of quartz with gossan and stains of malachite, the copper content perhaps reaching 2%; but in the central tongue of the cut can be seen iron-stained quartz, with bunches of tile-ore and stains of malachite, somewhat richer. This body has been trenched to 6 ft. below the floor of the opencut and filled in, but Mr. Matheson informed me that, though so poor on the surface, a sample from the bottom of the trench yielded 20% copper.[*]

There are 100 tons of ore from the open-cut at grass. It consists of very siliceous schist, all carbonate-stained and containing bunches of tile ore, fragments of quartz being often cemented by limonite, in which some of the original chalcopyrite can be distinguished. It is expected to yield between 10 and 15% copper.

Nothing of promise is to be seen here. The quartz has presumably segregated, during the metamorphism of the country into chloritic schist, especially along crush-zones which have later allowed circulation of cupriferous solutions. It is possible that some hundreds of tons of comparatively low-grade and siliceous ore may be broken down here, but there is no likelihood of payable ores being found to descend.

Hilda (M.L. 242).

Mgr., Matheson.

LOCATION, AREA, ETC.

The Hilda is about 1 mile west of the Comet. The country is low rolling ridgy, and it is covered with stunted box and gum and with scrubby heath.

Its area is 10 ac. This lease is the property of the Willcocks Cloncurry Development Syndicate.

DEVELOPMENT.

There is only one shaft on this lease. It was sunk 27 ft. by Mr. Allis, the former holder, and has been continued 3 ft. by the syndicate. It is vertical for 20 ft., and then underlies 3 in 1 to the northwards.

The manager's reports to the end of March, 1907, state that the shaft has since been sunk a total of 64 ft., and levels opened east and west at the 60-ft. level.

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[*] Since my visit the shaft has reached the hanging-wall of the formation at 46 ft., and at 58 ft. was in iron oxides, quartz, and hard copper carbonates. The ore-body has been proved to be 10 ft. wide in the crosscut on the 50 ft. level, 10 tons of 20% ore having been produced, the average contents of the whole being therefore 5%, though the first 4 ft. averaged 25%. In the eastern drive the face at 6 ft. distance from the crosscut assayed 9% over a width of 10 ft.; but at 12 ft. the 5 ft. on the hanging-wall assays 20%, the footwall portion being very siliceous and low in copper; at 18 ft. half the product was rejected, leaving 18% ore, and the face at 22ft. is unchanged.

ORE-BODIES.

The outcrop strikes west 30° north. For 1 ch. north-west of the shaft quartz, with much lime and some gossan, is to be seen, when there is a break for ½ ch., and then another crop for a similar distance, beyond which there are only a few small lenses of quartz on the line of strike. For 2 ch. to the south-east of the shaft limestone, quartz, and quartz-bearing schist crop on the line, giving little indication of the rich ore met in the shaft. The country north of the shaft shows abundant epidote, and, though resembling an altered volcanic, is apparently a metamorphosed sedimentary.

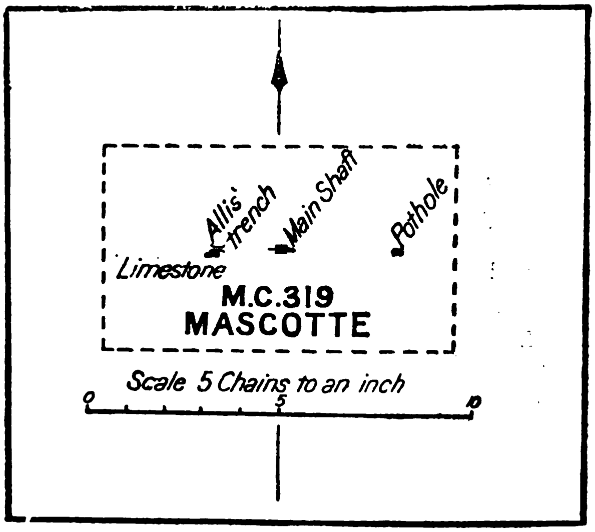
In the shaft the country is indurated near the lode, but the walls are not slickensided, though well defined, and there is 2 to 3 in. of earthy lime, with inclusions, on the footwall from top to bottom of the shaft. Much quartz was found with the limonite for about 15 ft. from the surface. At the shaft bottom the ore-body—mostly dense limonite with disseminated malachite and cores of tesselated chalcopyrite and chalcocite, and of almost pure chalcocite—gossany in parts, is 3 ft. wide,* and from the last 3 ft. of sinking 8 tons of 15% ore were paddocked.† The gossany parts of the ore contain a considerable amount of manganese dioxide, and a few drusy calcite crystals were noticed. The ore in the lower part of the shaft is noticeably free from quartz, and will therefore be valuable in smelting mixtures, even though yet comparatively low in copper.

Mascotte (M.C. 319).

Mgr., Corney.

LOCATION, AREA, ETC.

gossan betwen the old trenches. The country is schist rather indurated and jointed near the ore-body.



The trench at the main shaft exposes up to 3 ft. width of ferruginous calcite, containing patches of quartz and chalcocite; but, in the shaft the ore began to improve at 5 ft. below the surface, and in the bottom is exposed very good tile-ore (much resembling limonite) and malachite, with some chalcopyrite altering into chalcocite. The firsts paddocked amount to 2 tons, and are estimated to contain 40% copper, while the seconds, ½ ton, should yield 25%.

Allis's old trench, which is 5 ft. north of a small crop of limestone, and from which some splendid cuprite encrusted with malachite and embedded in powdery gossan has been taken, proves the ore-body exposed by it to pinch out within 10 ft.

In the eastern pothole can be seen iron-stained schist and gossan with tesselated limonite—very low in copper. This ore should be sunk on, as it is likely to improve beneath the surface.

Hermit (M.C. 339).

Mgr., Corney.

Location, Area, Etc.

The Hermit lies about 1½ mile east of the Mascotte.

Its area is 600 x 350 ft. It was not visited.

Output.

1906 ... 6 tons shipped (Press).

Ore-body.

The ore-body is said to be similar to that of the Mascotte.

CORELLA RIVER.

The mines are scattered over an area extending 20 miles from north to south and 10 miles from east to west, being located chiefly on western and southern affluents of the Corella River. Most of them were under exemption, and, being deserted, no attempt was made to locate and examine them.

The country is mostly mountainous, is badly watered, is poorly timbered, and is highly uninviting for any purpose except mining.

A dray road has now been opened from Duck Creek to the more important mines, which may also be reached by following up the Corella River from the Argylla road, the distance from Cloncurry to the Springs Camp, a well known centre, being approximately 50 miles by either route, though by an air-line west-south-west it is only 34½ miles.

EAST CORELLA GROUP.

This group is of little import, including only the Wakeful besides the claim here noticed.

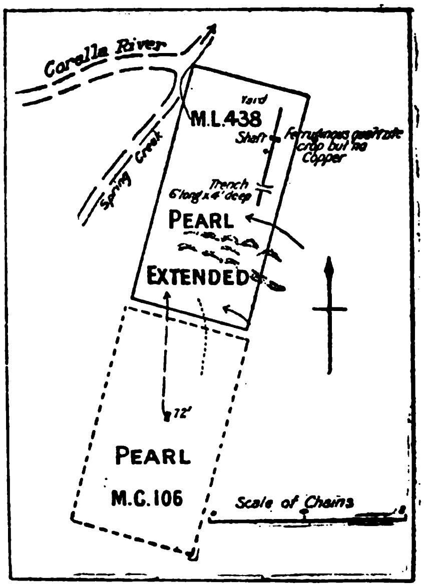
Lady Franklin (Extd. M.C. 122).

Mgr., Hinds.

LOCATION, ETC.

PEARL GROUP.

The group comprises the eastern leases on the Corella River, including the Imperial and Fairy, not mentioned below.



Pearl Extd. (M.L. 438).

Mgr., Lawes.

Location and Area.

The Pearl Extended is located on the eastern side of the junction of Jimmy's Springs Creek and the Corella river, 3 miles north-north-east of the Springs Camp.

Its area is 5 ac.

Development.

The workings comprise a trench, 6 ft. long and 4 ft. deep, near the middle of the eastern side, and a shaft, 18 ft. deep, 2 ch. to the north, sinking having been stopped by water.

Output.

1906 ... ... 1 ton at grass, carrying 5 % copper.

Ore-bodies.

To the north of the shaft barren ferruginous quartz outcrops, striking north by east. The shaft has passed through a body of gossan 18 in. wide dipping 3 in 1 to the westwards, and well worth following on the underlie.

The trench exposes a cupriferous gossany formation, 12 in. wide, on the line of strike of the gossan cut in the shaft, and under a gossany formation 4 ft. wide dipping west-by-north. About 1 ton of 5% ore is at grass here.

Pearl (M.C. 106).

Mgr., Lawes.

LOCATION AND AREA.

The Pearl adjoins the Pearl Extended on the south.

Its area is 600 ft. × 350 ft.

DEVELOPMENT.

A shaft, underlying 3 in 1, has been sunk in the centre of the claim to a depth of 72 ft., but was not accessible to me below the 40 ft. level, where there is a drive for 12 ft. to the north. A stope extends 10 ft. southwards from the shaft to 54 ft. below the surface. A second shaft, 15 ft. deep, lies in the south-western corner of the lease.

OUTPUT.

	$30\frac{1}{20}$	tons shipped, carrying from 32 to 37 % copper (*vide* Mr. Lawes)
1905 ...	14	,, ,, (by Lawes)
	$45\frac{19}{20}$	,, ,, ,,
Total ...	50	,, ,,

ORE-BODIES.

Little outcrop can now be seen at the shaft, but ore from near the surface shown me consists of chalcocite, limonite, and pyrite. The copper ore occurs as gossany bunches and leaders in crushed kaolinised schist. At 10 ft. below the surface there is 2 ft. 6 in. width of car-

DEVELOPMENT.

The main shaft is 20 ft. deep. Lidster's shaft, 20 ft. to the south-west, is 15 ft. deep and has a stope running 6 ft. to the east. Besides these there are numerous other potholes on the lease. No work has been done here lately.

OUTPUT.

1904	...	8	tons	shipped,	carrying	20%	copper.
,,	...	4	,,	,,	,,	25%	,,
1906	...	$4\frac{17}{20}$	,,	,,			
Total	...	$16\frac{17}{20}$	,,	,,			

ORE-BODIES.

The main shaft is in an irregular gossany formation, chiefly silicified country (sedimentary), carrying bunches of carbonates. At the eastern side of the shaft the country is stained over a width of 5 ft. adjacent to a 3 in. band of gossan, and at the shaft bottom over a width of 12 ft., but is not promising. The whole tip from this shaft would probably yield 2% copper.

Lidster's shaft is on a bunch of limonite, replacing chloritic schist and stained by malachite. Lidster shipped 4 tons of 25% ore from here, and there are now 5 tons seconds at grass.

Spring Peaks (M.L. 562).

Mgr., Allis.

LOCATION, ETC.

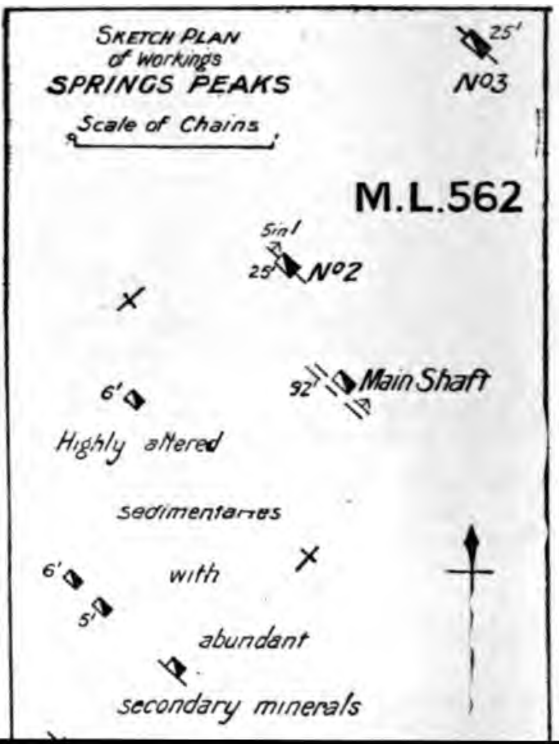
The Springs Peaks lease is located on the ridge-top east of Jimmy's Springs Creek, and 34 miles west-south-west of Cloncurry. The lease is ½ mile east-south-east of the Springs Camp on the Cloncurry road, and the brace of the main shaft is 150 ft. above the camp. The lease is in the midst of a worn-down mountain range being surrounded by rounded hills and ridges of approximately the same elevation. These hills are bare of timber, except for a few scattered mountain gum, there being little soil and that of a poor quality.

Its area is 20 ac. Prior to my visit it had been under option to the West Cloncurry Copper, Limited, but some dispute had caused the stoppage of all work in November last.

DEVELOPMENT.

The main shaft near the centre of the lease is 92 ft. deep. No. 2 shaft, 40 ft. to the north-north-west of the main shaft, is 25 ft. deep and inaccessible. No. 3 shaft, 2 ch. to the north-north-east of the main shaft, is 25 ft. deep and also inaccessible. No. 4 shaft, 20 ft. deep and inaccessible, is 2 ch. to the south-west of the main shaft. Besides the

shafts, there are 4 potholes, 5 to 6 ft. deep, one of them 1 ch. west of the main shaft and the three others on a north-west line 1½ ch. south-west of the same.



surface. The main shaft was put down with the idea of proving these at a depth, and at 60 ft. below the surface struck a fifth formation striking east 40° south and dipping north-eastwards, within a few degrees of vertical. Its thickness is generally less than 12 in. and it comprises chiefly ferruginous, crushed, broken, and powdered country (highly altered crystalline sedimentary). The walls are not slickensided, and the formation seems to be only along a large joint. At 60 ft. depth some bunches of malachite-stained chalcocite, replacing chalcopyrite were met, and several veins of chalcopyrite were cut at 70 ft. depth, one 6 in. wide there branching off the main formation and dipping into the northern side of the shaft. In the lower part of the shaft only occasional splashes and impregnations of chalcopyrite are found, and the seam contracts to 3 in. width, but is again opening out in the bottom, and further bunches of ore may therefore be obtained. There are at grass 3½ tons of ore consisting of chalcopyrite and chalcocite, the former having everywhere a thin coat of secondary sulphide on cracks, besides which there are bunches of the same mineral. The paddock is therefore expected to assay between 30 and 35% copper.

No. 2 shaft was opened on an outcrop of gossan, 2 ft. wide, with ill-defined walls; it is reported to have pinched in the bottom, and can be traced for only 10 ft. south-east of the shaft and 20 ft. to the north-west. It strikes south-east and north-west across the stratification of the country rock, and its dip is 5 in 1 to the north-east. There is about 1 ton of gossan, carrying 5% copper (as silicate), paddocked here, but the whole tip carries chrysocolla and will probably yield 5% copper.

No. 3 shaft exposes a north-west running formation of kaolinised slate carrying malachite, chrysocolla, and tile ore, but without sign of walls, the mineralisation being presumably along a cross joint. The 2 tons of firsts at grass are expected to yield over 30% copper.

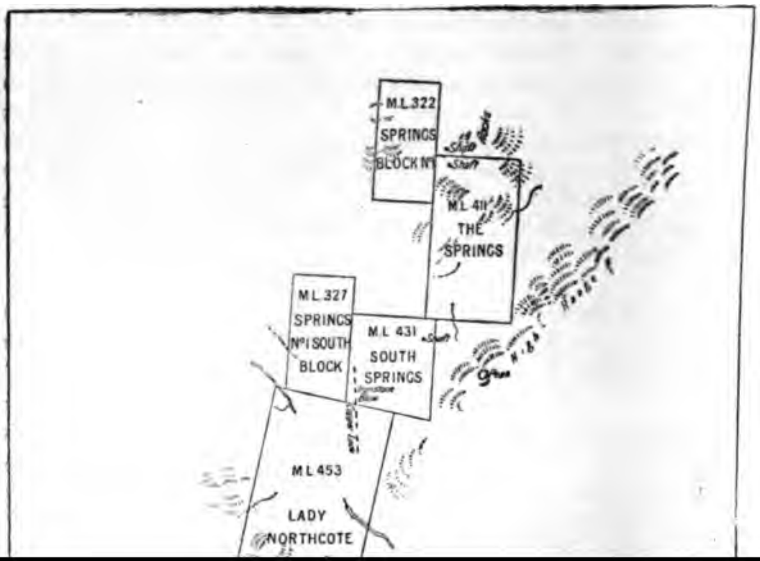
The pothole to the west of the main shaft shows only copper-stained altered slates.

The southernmost of the three holes to the south-west of the main shaft is alongside a 9 in. vertical band of gossany kaolin, the country for several feet to the south-west of which is stained on joints by blue chrysocolla. There is here, as already mentioned, a great development of secondary crystalline silicates. The central hole is in ferruginous kaolinised country with some gossan, but shows no definite lode, though the faces should average 2% copper. The northernmost hole is also in cupriferous and iron-stained country; but 2 tons of cupriferous gossan were obtained here. The 3 tons of rich ore bagged alongside the hole has been "gouged" from different crops all over the lease.

No. 4 shaft is in stained country, adjacent to a north-west striking bunch of ore, 12 in. wide, which has been taken out over a length of 10 ft. There are 3 tons of firsts bagged at the brace, and 4 tons of cupriferous gossan, carrying 10% copper, have been paddocked.

SPRINGS GROUP.

The group includes, besides those described below, the following leases:—Hit or Miss, Pool, Springs Block No. 1, Springs No. 1 South, Springs South, Lady Northcote, Kenilworth, and Ivanhoe No. 1 South.



Springs (M.L. 411).

Mgr., Entriken.

LOCATION, ETC.

The Springs lies about 1 mile north-west of the camp of the same name.

Its area is 10 ac.

DEVELOPMENT.

A shaft had been sunk 45 ft. in January, 1905.

OUTPUT.

1905	...	25 tons ore shipped.

ORE-BODY.

Lode runs nearly north and south and averages over 6 ft. in width. "It is grey-ore* and of first class quality." "An almost solid body of grey-ore* shows across the width of the shaft at that (45 ft.)

Ivanhoe (M.L.).

Mgr., Hare.

LOCATION, ETC.

The Ivanhoe lies south of the Springs lease.

DEVELOPMENT.

There are a cut, 15 ft. long and 6 ft. deep; a trench, 30 ft. long and 3 ft. deep, on the eastern side of the hill; and a shaft, 10 ft. deep, west of the trench.

OUTPUT.

1904	...	4 tons shipped
		8 ,, seconds at grass
1905	...	15 ,, at grass, low grade.

ORE-BODY.

A formation, 20 ft. wide, at the cut, "Can be traced for a considerable distance." "A large outcrop of medium grade on the same line of outcrop as the Springs."

LADY GROUP.

The Lady Group, which includes the Ralston Leases and a few others, comprises the Lady Ethleen, Lady Nicotine, Lady Jenny, Lady Emily, Lady Amy South, Lady Amy, Lady Amy North, Morning Star,

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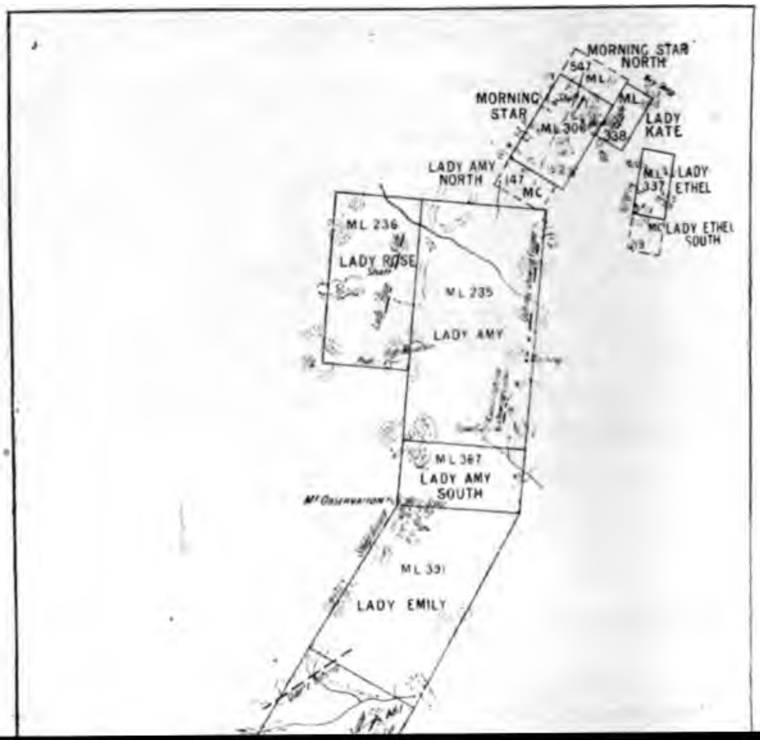
* Presumably glance is meant.

Morning Star North, Lady Rose, Lady Ethel South, Lady Ethel, and Lady Kate. Of these only the first, third, seventh, eighth, ninth, and eleventh were being worked.



Lady Ethleen (M.L. 233).

Mgr., Moore.

LOCATION, ETC.

The Lady Ethleen is the southernmost of the Lady Group, and is 3 miles south-west of the Springs Camp.

Its area is 80 ac. The lease is held under option by the Queensland Exploration Company.

DEVELOPMENT.

An adit, in the eastern part of the lease, was 100 ft. in length*, when inspected, the approach being 24 ft. long.

ORE-BODY.

The main outcrop is on a ridge over 100 ft. above the level of the adit, which is being put in in a north-north-easterly direction, but is as yet in indurated slates with ironstains on cracks. The whole cap of the ridge, over a width of a chain, is iron-stained and silicified, the cupriferous gossany part being only 20 ft. wide and the copper content not more than 1%. Copper ore does not appear on the surface within 4 ch. of the adit mouth. There is nothing to indicate that rich ore except in bunches or thin veins will be found on the adit level.†

Lady Nicotine (M.L. 528).

Mgr., Moore.

LOCATION, ETC.

The Lady Nicotine adjoins the Lady Ethleen on the north.

Its area is 8½ ac. It is held under option by the Queensland Exploration Company.

ORE-BODIES.

The lease is on the Lady Jenny-Lady Ethleen line, but nothing has been done to prove it here.

Lady Jenny (M.L. 234).

Mgr., Moore.

LOCATION, ETC.

The Lady Jenny adjoins the Lady Nicotine on the north.

Its area is 80 ac. The property was being tested under option in November last by the Queensland Exploration Company.

DEVELOPMENT.

An opencut, near the centre of the eastern side of the lease, is 100 ft. in length, and its average depth at right angles to the surface is 7 ft.

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* At the end of December, 1906, the underground manager (Mr. McLeod) reported it to be 175 ft. in length.

† The underground manager informed me in December last that small and irregular but rich veins of ore had been met over a width of 12 ft.

An adit in the north-eastern part of the lease has an approach 20 ft. long, and is itself 155 ft. in length.[*] For two-thirds of its length it runs south-south-west, the inner third bending round to south-west-by-south.

A pothole sunk 1¼ ch. south of the adit has been filled in again.

ORE-BODIES.

A large outcrop of quartz runs north 30° east (dipping steeply north-north-westwards) along the eastern side of the lease, and several gossany outcrops have been found in the country adjacent to it on the east.

The long trench on the range top was opened to test this ground, the outcrop comprising quartzites and schists, the latter where crushed carrying malachite. The exposure, however, is very disappointing—decomposed schist, quartzite and altered porphyry (?), in places rather thin-bedded. There are thin veins of gossan and occasional lumps of limonite and chrysocolla, the richest not containing more than 1% copper, while the average of the whole length of the trench would not be above a trace.

The pothole south of the adit is in green-stained country rock, with much quartz. The ore is somewhat gossany, and is promising in appearance, but none of that now visible carries more than 15% copper.

The main crop pinches out 2 ch. south-south-west of the mouth of the adit. It is 50 ft. in greatest width, and consists of crushed schist and shattered quartz with limonite and malachite, the copper

The outcrops are not worthy of any further attention. The ores on the surface are poor, and likely to be poorer below, as shown in the adit. If, however, any more work is to be done here in search of even medium grade ore, it should be in following the gossans. The wide outcrop on the surface south of the adit is similar in character to the Tharsis (Duck Creek), and considerable quantities of low-grade ore are therefore to be expected here.

Lady Emily (M.L. 391).

Mgr., Moore.

LOCATION, ETC.

The Lady Emily adjoins the Lady Jenny on the north.

Its area is 60 ac. It is held under option by the Queensland Exploration Company.

ORE-BODIES.

Nothing has been done to prove the ore-bodies on this lease, though the Lady Jenny crop and another enter it.

Lady Amy South (M.L. 387.)

Mgr., Williams.

LOCATION, ETC.

This lease lies between the Lady Emily and the Lady Amy.

Its area is 20 ac.

No prospecting has yet been done on this lease.

Lady Amy (M.L. 235).

Mgr., Moore.

LOCATION, ETC.

The Lady Amy adjoins the Lady Amy South on the north.

Its area is 80 ac. It is under option to the Queensland Exploration Company.

DEVELOPMENT.

One cut, 30 ft. in length, was opened about two years ago on the ridge top in the north-eastern corner, and there are two potholes on the southern boundary near the south-eastern corner peg.

ORE-BODIES.

The country here is highly altered slate striking north 15° west, any variation from vertical being to the westwards. Small isolated bunches of copper ore, of a few tons weight, occur in these slates, two of which have been exposed in the southern potholes, where there is 18 in. to 2 ft. width of cupriferous gossan dipping 3 in 1 to the north. About 5 tons of ore has been shipped from here.

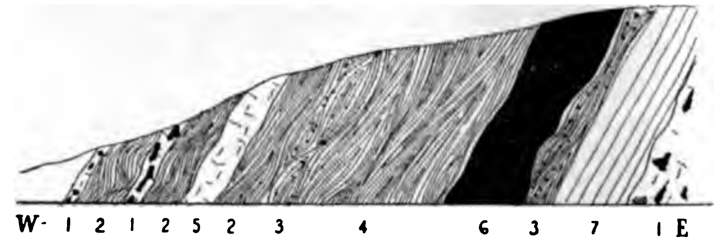

FIG. 21.—SECTION IN CUT LADY AMY.

Scale: 4 ft. to an inch.

1. Quartz and gossan
2. Schist
3. Ferruginous schist
4. Schist with ferruginous partings
5. Iron-stained quartz
6. Cellular gossan
7. Slate.

The big cut is in a green-stained and gossany crop, 30 ft. wide and consisting of alternate bands, dipping 60° to the west-north-west, of schist and quartz more or less iron-stained and resembling the Tharsis crush-zone. (See Fig. 21.) This can be followed down the hillside for 5 ch. to the south-west and up the hillside for 1 ch. to the north-east. The most promising part of the exposure is at the eastern end of the cut, where there is 3 ft. width of quartz and gossan separated from a 3 ft. band of cellular gossan by 18 in. ferruginous schist and 3 ft.

carrying 35% copper, were obtained here, and have been shipped. There is now paddocked 1 ton of firsts and 1 ton of seconds carrying 15% copper.

Morning Star (M.L. 306).

Mgr., Chaplain.

LOCATION, ETC.

The Morning Star adjoins the Lady Amy North on the north.

Its area is 16 ac.

DEVELOPMENT.

The main shaft, 15 ft. deep, is near the northern end of the lease. A second shaft, also 15 ft. deep, lies 20 ft. to the east, and a third $2\frac{1}{2}$ ch. to the west, while a fourth, 15 ft. deep, lies 7 ch. to the south of the main shaft.

OUTPUT.

1906	...	$14\frac{10}{20}$	tons	shipped	(Chaplin and Connlisk—source doubtful).
		$14\frac{15}{20}$	,,	,,	(Chaplin) ,, ,,
		12	,,	,,	(Chaplin and Glendenning—source doubtful).
		$1\frac{10}{20}$	,,	,,	(Chaplin, Smith, and Connlisk—source doubtful).
		$4\frac{10}{20}$	,,	,,	(Chaplin and party—source doubtful).
		$47\frac{5}{20}$*			

ORE-BODIES.

At the main shaft there is a gossany formation, 15 in. wide at the surface and 3 ft. 3 in. wide in the bottom, containing much azurite, as well as malachite, tile ore, and chalcopyrite enriched by chalcocite. The formation is in schist with lenticular quartz veins, and it strikes north 10° east, dipping 3 in 1 to the westward. About 20 tons of 35% ore are stated to have been shipped from this shaft, and there are 12 tons now at grass.

The eastern shaft is on a 4 in. seam of ore lying parallel to that in the main shaft. A bunch of ore found here contained 2 tons, yielding 40% copper.

The western shaft is in country, stained with iron oxides and copper carbonate, and is probably adjacent to a bedding plane striking north-north-east. It is on the line of strike of the ore-body seen in the Lady Amy. Some 4 tons of limonite-chalcocite (glance) ore, carrying 25% copper, have been shipped from here.

The southern shaft is in a formation 3 ft. wide and carrying up to 10% copper and little or no quartz, just to the west of a quartz and gossan blow. Practically all the material raised from the shaft is cupriferous, and, though no ore has been bagged from here, 3 tons, containing 20% copper, have been paddocked. Sinking should be continued here, and a crosscut opened eastwards.

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* At the end of 1906, Mr. Chaplain stated that 25 tons of 35% ore had been shipped, and there were then at grass 20 tons of ore, carrying between 20 and 35% copper.

Morning Star North (M.L. 547).

Mgr., Chaplain.

LOCATION, ETC.

This adjoins the Morning Star on the north.

Its area is 5 ac.

Two potholes have been dug on this lease, 3 ch. north, and 6 ch. north-east of the Morning Star northern shaft.

ORE-BODY.

Large outcrops of copper-stained quartzite on this lease strike south 5° east. At the north-eastern hole there is 2 ft. 6 in. width of formation, 5 ft. of schist, and 18 in. of gossan, quartz, and copper ore—a not very promising exposure.

Lady Kate (M.L. 338).

Mgr., Chaplain.

LOCATION, ETC.

The Lady Kate adjoins the Morning Star on the north-east.

Its area is 5 ac.

OUTPUT.

1905	...	7 tons raised.

ORE-BODY.

In this lease there is a big crop of reddish quartzite on the joints of which a few small bunches of ore have been found with quartz.

Lady Ethel (M.L. 337).

Lady Ethel South (M.L. 219).

Mgr., Chaplain.

LOCATION, ETC.

This adjoins the Lady Ethel on the south.

Its area is 400 ft. × 350 ft.

OUTPUT.

Total ... 14 tons shipped, carrying 35% copper* (*vide* Mr. Chaplain).

Lady Rose (M.L. 236).

Mgr., Moore.

LOCATION, ETC.

The Lady Rose adjoins the Lady Amy on the west.

Its area is 40 ac. The property when visited was under option to the Queensland Exploration Company.

DEVELOPMENT.

The only work done has been the sinking near the centre of the lease of a shaft 91 ft., where water was met.

ORE-BODIES.

The shaft is in country on the western side of a blow of quartz striking north 30° east and dipping 8 in 1 to the north-west. The blow is 4 ch. in length, 20 ft. in width, and stands 35 ft. out of the ground. It is slightly stained by malachite in parts, carries occasional bunches of gossan, and one or two patches of copper ore including cuprite were noticed on the western side, where also "copper weed" is growing. The indications, however, do not justify any further work here. The shaft at the time of my visit had just reached quartzite carrying crystals of pyrite.†

Ferruginous and copper-stained quartz crops 2 ch. to the south-west of the big blow, but is scarcely worth any further attention.

WEE MACGREGOR GROUP.

The Wee MacGregor Group lies less than a mile west of the Lady Group, from which it is separated by a practically inaccessible range. The leases lie some of them within the catchment area of Jimmy's Spring Creek and some within that of Cattle Creek, both of which are tributaries of the Corella. The former are connected with the Springs Camp by a fairly good dray road, but all stores for the latter have to be packed over the divide.

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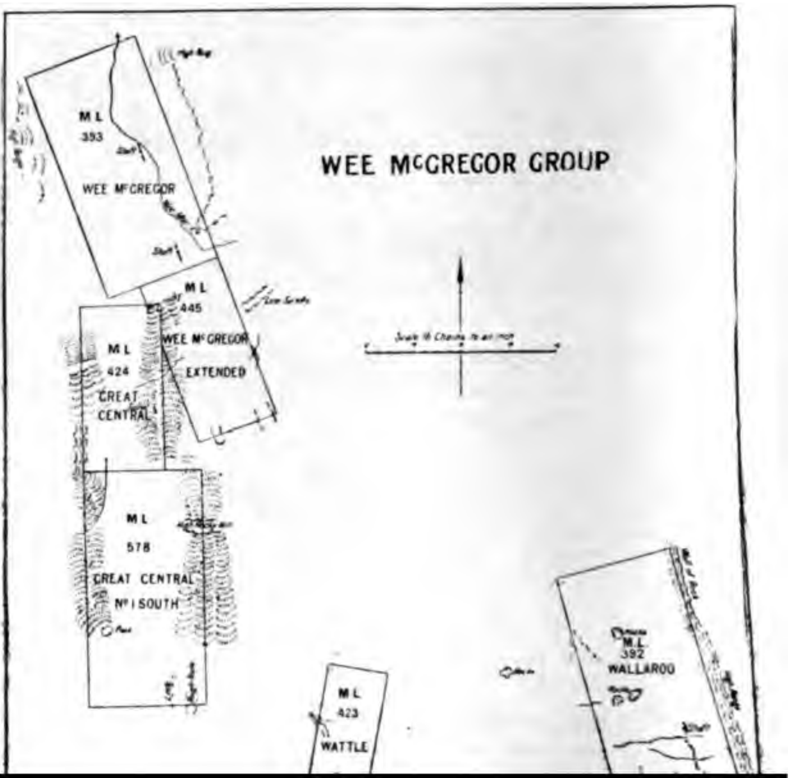
* This is reported to have comprised only surface boulders from various parts of the lease.

† Mr. McLeod, the underground manager, informed me in December that at 100 feet from the surface only barren quartz was exposed.

The country rocks comprise schists, quartzites, and an altered felspathoidal rock that may be porphyry.

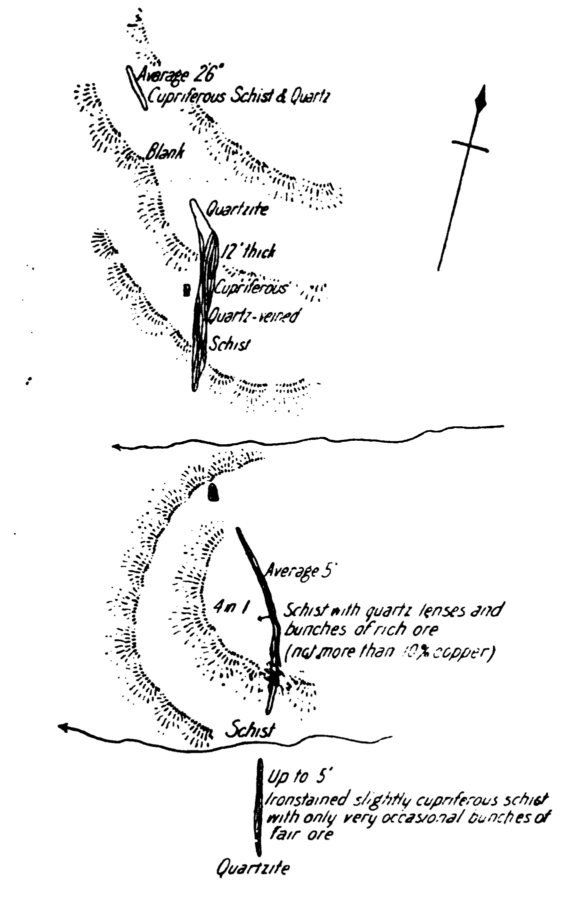


DEVELOPMENT.

Work had only just begun in December last, one shaft having been sunk 17 ft. This is located 5 ch. from the southern boundary and 3 ch. from the eastern.

ORE-BODIES.

The ore-bodies here occur in five separate outcrops, extending over a total distance of 8½ ch. in a general north-by-west direction, the difference in elevation of the crops on the ridges and those in the gullies being 50 ft.


Average 26'
Cupriferous Schist & Quartz
Blank
Quartzite
12' thick
Cupriferous
Quartz-veined
Schist
Average 5'
4 in 1
Schist with quartz lenses and bunches of rich ore (not more than 10% copper)
Schist
Up to 5'
Ironstained slightly cupriferous schist with only very occasional bunches of fair ore
Quartzite

SKETCH PLAN OF OUTCROP, WALLAROO

Over one half of the main crop is quartz, occurring as parallel lenticular veins, and one quarter is schist, the copper ore (malachite and limonite) occurring chiefly in the former where crushed, as on the Chinaman freehold and others at Duck Creek.

Iron-stained quartzite lies to the east of this outcrop, and reddish quartzites to the west of the shaft. The main crop strikes north-north-east dipping 3 in 1 to the west-north-west. Near the centre of the crop it is cupriferous over a width of 10 ft., and my sample contains cellular and clayey quartz-bearing gossan and dense limonite impregnated with malachite and chalcocite; chloritic schist veined with quartz and stained by malachite; and granular iron-stained quartz. It carries (Government Analyst):

Copper ... = 13·2%
Gold ... = 5 dwt. per ton.
Silver ... = 6 ,, ,,

The shaft is being sunk in schist 6 ft. to the west of this spot, and at the time of my visit had just struck bunches of ore, of which 1 cwt., estimated to carry 30% copper, had been raised—fine grained malachite and azurite with tile ore. Further sinking is warranted, as there is likely to be here large quantities of low grade siliceous sulphides below water level.*

The copper ore fails within 1 ch. to the south, but the quartz, which continues a little further in the schists, is still ferruginous.

The southernmost crop, ½ ch. to the south-west of the last, is 5 ft. in greatest thickness. It is composed of iron-stained, but only slightly cupriferous, schist and quartz, with only occasional bunches of fair grade ore. Beyond it to the south pinkish quartzite appears.

Wattle (M.L. 423).

LOCATION, ETC.

The Wattle lies 16 ch. west of the Wallaroo.

Its area is 5 ac. The ground is held by the Wee MacGregor Cloncurry Mines, Ltd.

Work had not begun here at the time of my visit to the group, and my time being short, it was therefore not inspected.

LITERATURE.

For title of report, numbered as below, see Introduction.

(12) Mr. Waller has written:—

> The lode strikes 20° East of North, and dips to the West. It outcrops for a distance of 200 feet, showing Copper ore in several places. The principal outcrop of Copper ore is situated towards the south end of the lode, and consists of gossan and quartz carrying carbonate and oxide of copper, and a little glanz and yellow Copper. This outcrop is 20 feet long by 6 feet wide. A surface sample taken from here returned 19 per cent. Copper.

Great Central (M.L. 424).

LOCATION, ETC.

The Great Central is located south of the Wee MacGregor.

Its area is 10 ac. The lease is held by the Wee MacGregor Cloncurry Mines, Ltd.

LITERATURE.

For title of report, numbered as below, see Introduction.

(12) Mr. Waller's report is as follows:—

> The lode is a very large one, about 100 feet in width, and composed at surface of gossan and quartz. . . . The western or hanging-wall portion of the lode appears to be mainly quartz, while the eastern or footwall portion is gossan. The gossan extends along the surface for 400 feet, containing more or less Copper the whole way, but the main shoot of ore is approximately in the centre. The gossan at this place is 70 feet wide, and appears to carry good Copper for the whole of this distance. Practically every stone broken carries good Copper, and most of it is of good grade. A rough sample taken right across the 70 feet, omitting only one or two small lenses of quartz, gave a return of 17 per cent. Copper. This good ore appears to extend along the lode for about 120 ft., though probably it does not maintain its full width of 70 feet for the whole of this distance. At any rate, the surface indications point to the presence of a large and rich ore-body in this lode, which deserves to be energetically opened up. . . .

DEVELOPMENT.

Work had not long commenced when this lease was visited in December last, there being then only an adit 17 ft. in length with an approach 30 ft. long. This is 1 ch. from the eastern boundary and 6 ch. from the southern.

ORE-BODIES.

A belt of schist, running nearly north and south and dipping 10 in 1 to the west, has here been found to be cupriferous over a limited area. This belt, which lies between two bands of quartzite, is 150 ft. in greatest width, and shows signs of great crushing. Lenticular quartz veins have been developed, and the intervening schists are very ferruginous, and in addition they are stained by malachite over the whole width. Southwards of the thickest part the copper ores are somewhat more concentrated, there being crops, 6 ft. wide and 30 ft. long, that will probably yield 10% copper, and give promise of being richer below.

Beyond a chain to the south, however, the iron and copper contents may be considered negligible quantities, and the place of the schist is taken by barren white quartzite. Northwards of the thickest part of the area the amount of copper in the schists decreases, and, at a chain distant malachite is found instead staining ferruginous cellular quartz on the line of the strike of the western quartzite band, which passes 1 ch. to the west of the mouth of the adit. The schists are quite barren at the mouth of the adit, which is being opened to prove the cupriferous country at a depth of 85 ft. below the crop, and is 2½ ch. to the north of

LITERATURE.

For title of report, numbered as below, see Introduction.

(12) Mr. Waller writes:

> This is a large lode, out-cropping at the surface for a distance of 1,000 feet. . . . The width of the lode varies from 6 feet to 15 feet, and may be even wider in places. The outcrop is composed of moderately soft but somewhat siliceous gossan, carrying more or less Copper in the form of carbonates and oxides, associated with occasional lenses of quartz. Of the 1,000 feet of outcrop, approximately one-half, or 500 ft., carries apparently good Copper. No work has yet been done on the lode, so it is at present only possible to speak of surface indications. These are of a highly promising character. A sample from the outcrop at the North end, taken by chipping here and there along the outcrop, returned 20 per cent. copper. At the South End the width of ore of this grade is at least 15 feet. A few very rich boulders of red oxide of Copper are to be seen at the surface at this point, assaying up to 80 per cent. Copper.

DEVELOPMENT.

Work was in the initial stages at the time of my visit in December. One shaft, near the centre and 2 ch. from the eastern boundary, was only 15 ft. deep; and the other, 2 ch. from the southern boundary, was 20 ft. deep.

ORE-BODIES.

The northern outcrop comprises crushed schist, veined with quartz over a width of 12 ft., and a length of about 1 ch. Stains of malachite are to be seen, but do not appear to extend below the surface. The crop is somewhat gossany, and this is the most promising feature about it. No trenching has been done, but the shaft is being sunk on the western side, the first 15 ft. of sinking having been in ferruginous decomposed slate, with slight stains of copper and occasional bunches of ore, rather more abundant and richer near the surface than in the lower part. A second crop, 1 ch. in length, occurs 1 ch. to the south-south-east on the line of strike of the above.

The southern crop extends from the shaft for 40 ft. to the north and 30 ft. to the south, the greatest width (8 ft.) being just south of the shaft, although malachite stains were noticed in the country over much greater widths. It is made up of crushed schist with veins of quartz and slight impregnations of malachite. The richer portions, which may be 2 ft. in thickness and which each contain a few tons, are expected to run 20% copper, but the crop as a whole will not yield more than 5%. The shaft is on the western (hanging-wall) side, and to 20 ft. depth, where much quartz was appearing, is in kaolinised country with copper stains, impregnations, and bunches. These bunches not infrequently have a kernel of cuprite or of cuprite and limonite surrounded by laminated malachite, the outer parts of which contain much clayey impurity. (See Fig. 22.) About 1 ton of ore has been paddocked and this consists of one-third ferruginous cuprite, one-third malachite, and one-third clayey impurity, the whole stained by earthy malachite and azurite and averaging perhaps 40% copper. The

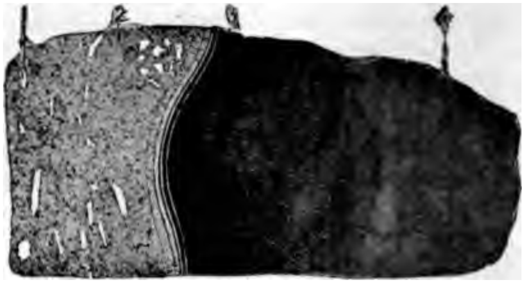
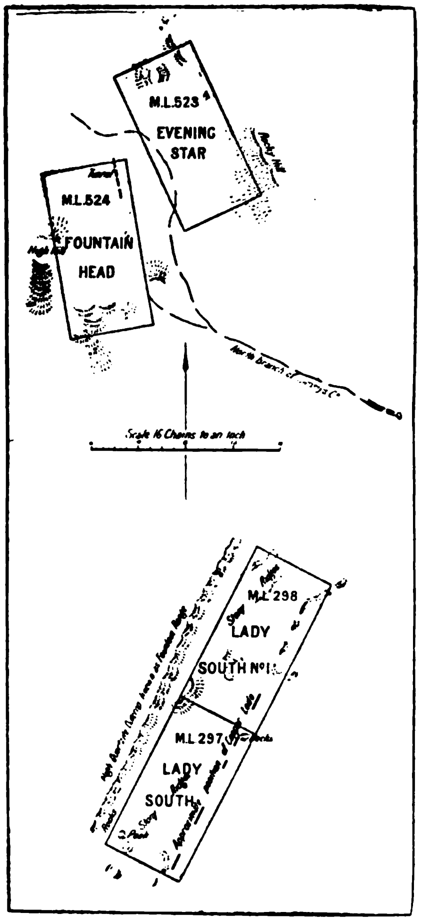


FIG. 22 (NATURAL SIZE).—OXIDISED ORE, WEE MACGREGOR.

1. Kaolin
2. Earthy malachite
3. Limonite
4. Cuprite (ferruginous towards the limonite).

LADY SOUTH GROUP.

The group includes, besides those mentioned below, the Lady h No. 1, the Evening Star, and the Hæmatite.



Lady South (M.L. 297).

Mgr., Donner.

LOCATION, ETC.

The Lady South lies just east of the Fountain Range, 1½ mile h-south-west of the Lady Ethleen and 10 miles south-west of the ngs Camp.

Its area is 10 ac.

ORE-BODY.

The surveyor's plan shows the outcrop to run north-north-east.

Fountain Head (M.L. 524).

Mgr., McCormack.

LOCATION, ETC.

The Fountain Head is on Jimmy's Spring Creek, 1¼ mile south-by-east of the Wallaroo.

Its area is 10 ac.

A tunnel has been opened in the north-eastern corner of the lease.

ORE-BODY.

An outcrop, striking north-by-west, is shown on the surveyor's plan.

MELBA GROUP.

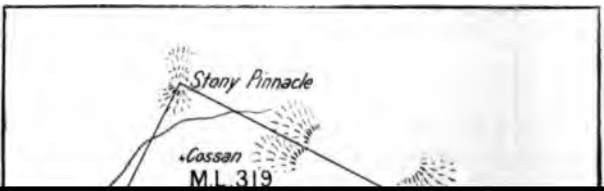
The group consists of only the Melba and the Rising Sun, the latter of which was not visited.

Melba (M.L. 319).

Mgr., Matheson.

LOCATION, ETC.

The Melba is situated on the western bank of the Corella River, 6½ miles west-by-north of the Springs Camp. The distance by the



dray track down the river to the Rosebud is twice the above. It is 3½ miles west-south-west of the Mona.

Its area is 10 ac. The lease is held by the Willcocks Cloncurry Development Syndicate.

DEVELOPMENT.

A shaft has been sunk to a depth of 50 ft., and from it drifts have been opened 12 ft. north-west and 15 ft. south-east, and crosscuts 10 ft. north-east and 12 ft. south-west. This is in the south-eastern corner of the lease. One or two shallow holes have been made in the vicinity of the shaft, and there are two trenches near the centre of the lease.

OUTPUT.

1906	...	60 tons shipped, carrying 25% copper (manager's report)
		15 ,, seconds at grass.

ORE-BODIES.

There is little on the surface to indicate the existence of any quantity of rich ore here. A formation (that met in the eastern drive) is to be seen in a pothole 20 ft. north-east of the shaft. Ill-defined bunches of carbonate-bearing ore were noticed 2½ ch. north-west of the shaft, and gossan at 3, 4, and 10 ch. distant from the same. The trenches near the centre of the lease offer disappointing exposures and are apparently on separate lenses.

Most of the ore, which occurs in lenticular bunches, seems to have come from the upper part of the shaft. The ore-bearing seam passes out of the shaft to the east at 20 ft. from the surface, but comes in again at the shaft bottom.

In the north-western drive stringers and small lenses of slightly decomposed pyrite were noticed in schist, between two vertical partings 2 ft. apart. The south-eastern drive is in chloritic schist with some sintery lime towards the end. At the end of the south-western crosscut there is a formation of schist, 2 ft. 6 in. wide, partly replaced by chalcopyrite, now in process of alteration into limonite. It is ill-defined and not to be expected to last, even though the footwall country is somewhat slickensided internally. The north-eastern crosscut is in a loose granular siliceous formation having some resemblance to fault ground. Scattered through it are crystals of actinolite and crystalline country rock, and lumps of glance, with scattered grains of chalcopyrite, are stated to have been found in the more ferruginous portions, as well as nodules of malachite.

Further sinking to test this formation is warranted. The paddock at the shaft has 15 tons of poor seconds (limonite with scattered pyrite). The manager's reports state that 40 tons of 25% ore were obtained from within 14 ft. of the surface, but only 20 tons were obtained from the remainder of the sinking, driving, and cross-cutting.

SECRET GROUP.

Neither the Secret nor the Shakespear, the second lease in this group, was visited, and no particulars of interest being available, the latter is omitted.

Secret (M.L. 264).

Mgr., Matheson.

LOCATION, ETC.

The Secret is in a deep and narrow valley 4 miles west-by-north from the Springs Camp, and 3 miles south-south-east of the Rosebud.

Its area is 10 ac. This is held by the Willcocks Cloncurry Development Syndicate.

DEVELOPMENT.

Near the southern boundary a shaft was sunk 33 ft., and No. 1 crosscut opened from the bottom (16/9/05). Shaft 50 ft. deep (5/10/05) and No. 1 crosscut 27 ft. in ; No. 2 crosscut, at 50 ft., in 12 ft. Shaft 95 ft. (21/5/06) and No. 3 crosscut 19 ft. in.

ORE-BODIES.

A formation, 22 ft. wide and carrying 11% copper, is reported* to have been met in No. 1 crosscut, and No. 2 crosscut proved 24 ft. of ore assaying 10·5% copper.† The last 7 ft. is said to be in cupreous iron pyrite.

ROSEBUD GROUP.

No particulars of the Nick of Time are available, and it has therefore been omitted from this record. None of the leases was inspected.

assaying 11·1% copper; No. 2 crosscut—15 ft. ore assaying 8%; No. 3 crosscut—20 ft. ore assaying 2·4%; and No. 4 crosscut—siliceous ore assaying 2·5%. These the manager considered unsatisfactory. The lode became very pyritous in the winze, but the copper value continued constant.

Mona (M.L. 520).

Mgr., Woods.

LOCATION, ETC.

The Mona is on the northern side of the Corella River, 4½ miles north-west of the Springs Camp. It is 12 ch. north of the Nick of Time.

Its area is 5 ac.

One shaft has been sunk near the centre of the lease.

OUTPUT.

1906 ... 23 tons shipped.

ORE-BODY.

The surveyor's plan shows the outcrop striking north-north-west.

JUBILEE GROUP.

The Sunflower and Mountaineer have not been included here, as no description has been made of the ore-bodies. The group was not visited.

Jubilee (M.L. 460).

Mgr., Lobston.

LOCATION.

The Jubilee is on Running Creek, 8 miles north of the Springs Camp. It adjoins the Printy, and lies 3 miles north-west of the Imperial.

AREA.

Its area is 15 ac. The ground has been under option to Jacomb's Syndicate.

DEVELOPMENT.

There are two shafts on this lease—No. 1, 32 ft. deep; and No. 2, 46 ft deep. One of them is near the centre of the eastern side, the other near the middle of the southern.

ORE-BODY.

The surveyor's plan shows a lode striking north-by-east from the southern to the northern shafts and then north-north-west to the northern boundary. The outcrop is similar to that on the Springs—a formation carrying bunches of ore. The ore at 45 ft. in No. 2 shaft is said to have assayed 34·7%.

OUTPUT.

1904	...	25$\frac{13}{20}$	tons shipped	(from Corella P.A.)
1905	...	18	„ „	(„ Jubilee and Printy)
	Total	43$\frac{13}{20}$	„ „	

Printy (M.L. 255).

LOCATION, ETC.

The Printy adjoins the Jubilee on the north.

Its area is 20 ac.

Some work has been done in the south-eastern corner.

ORE-BODY.

The ore-body worked is believed to be on the line opened in the Jubilee, the general strike of which in this lease is slightly west of north-north-west.

SUNSET GROUP.

Nothing is known of the nature of the May Day and Alice G. ore-bodies, and descriptions of the leases have therefore been excised. The group was not visited.

Sunset (M.L. 267).

Mgr., Campbell.

LOCATION, ETC.

The Sunset is on Green Creek, 10 miles north-by-west from the Springs Camp.

Rosewood (M.C. 289).

LOCATION, ETC.

The Rosewood (or Sunset No. 1 South) is on Green Creek, 9½ miles north-by-west of the Springs Camp, and adjoins the Sunset on the south-east.

Its area is 10 ac. It is one of the leases held by the Willcocks Cloncurry Development Syndicate.

Lidster (M.L. 348).

Mgr., Entriken.

LOCATION, ETC.

The Lidster is 10 miles north-by-west of the Springs Camp.

Its area is 40 ac.

DEVELOPMENT.

An adit runs 10 ft. into the lode formation (5/3/06), in about the centre of the lease. This was put in by Jacomb's Chillagoe Syndicate.

ORE-BODIES.

Mr. Warden Cherry reported—"A very large copper-stained formation, with occasional patches of gossan and seams of ore." (5/4/06.)

Rose (M.L. 332).

Mgr., Allis.

LOCATION, ETC.

The Rose lies 10½ miles north of the Springs Camp.

Its area is 5 ac. It is held under option by the West Cloncurry Copper, Ltd.

Wilmot's Valley (M.L. 374).

Mgr., Wilmot.

LOCATION, ETC.

Wilmot's Valley lies 11½ miles north-by-west of the Springs Camp. It is a mile and a half north of the Sunset.

Its area is 10 ac.

DEVELOPMENT.

A shaft was 27 ft. deep, and driving was going on in December last.

OUTPUT.

1906 ... 10 tons shipped (reported).

ORE-BODIES.

The shaft is on the middle of three parallel outcrops, striking within a few degrees of north. There is reported to be a fair amount of 22% ore here, which it does not pay to ship.

ENQUIRY GROUP.

The King's Crown belongs to this group, but has been omitted on account of no particulars being available. The mines were not visited.

Enquiry (M.L. 265).

LOCATION, ETC.

The Enquiry lies on Green's Creek 10 miles north-west of the Springs Camp.

Its area is 5 ac. This is one of the Willcock's Cloncurry Development Syndicate's leases.

One small cut has been opened.

OUTPUT.

1906 ... 5 tons of fairly good ore at grass.

ORE-BODY.

The manager has stated that the Enquiry is of little importance. The cut exposes 3 to 4 ft. of copper-bearing formation, according to Mr. Cherry.

Snowstorm (M.L. 317).

LOCATION, ETC.

The Snowstorm is on Charley's Creek 12½ miles north-west of the Springs Camp.

Its area is 5 ac. The lease is under option to the West Cloncurry Copper, Limited, but has not been worked.

King's Cross (M.L. 426).

Mgr., Carty.

Location, Etc.

The King's Cross is located 11½ miles north-by-west from the Springs Camp.

Its area is 20 ac.

The shaft was reported to be 15 ft. deep in December, 1906.

Ore-bodies.

The ore is said to be of medium grade quartz and gossan. The shaft exposes over 4 ft. of lode apparently increasing in width. Warden Cherry states the country is granite (5/4/06).

MOUNT LIDSTER GROUP.

Little is known of any of the leases of this group.

Mount Lidster (M.L. 339).

Mgr., Entriken.

Location, Etc.

The Mount Lidster lies 14½ miles north of the Springs Camp. It is 1 mile north-east-by-north from the Hidden Treasure.

Its area is 80 ac.

Development.

There are two shafts here, 30 ft. and 60 ft. deep respectively (December, 1906), and sunk by Jacomb's Chillagoe Syndicate under option.

Ore-body.

The outcrop is stated to extend north-eastwards over 35 ch. on the lease, but the best ore is exposed at the northern end. One of the shafts is reported to have been sunk in country the other in gossany ore rich in copper.

Hidden Treasure (M.L. 362).

Mgr., Phillips.

Location, Etc.

The Hidden Treasure is 13 miles north-by-west from the Springs Camp. It is 2 miles by track from Mount Lidster.

Its area is 5 ac.

The shaft is 15 ft. deep (Dec., '06). Idle.

Output.

1906 ... 20 tons at grass (5/4/06). Some of good quality.

Ore-bodies.

The Hidden Treasure, May Day, and Mount Lidster are understood to be all on one line.

Faded Rose (M.L. 357).

Mgr., Allis.

LOCATION, ETC.

The Faded Rose is 14 miles north-by-east from the Springs Camp, and adjoins the Roseleaf.

Its area is 10 ac. The lease is under option to the West Cloncurry, Ltd.

Roseleaf (M.L. 328).

Mgr., Allis.

LOCATION, ETC.

The Roseleaf adjoins the Faded Rose on the north-east.

Its area is 10 ac. The lease is under option to the West Cloncurry Copper, Ltd.

The shaft in December, 1906, was said to be 20 ft. deep. Idle.

CHARLEY'S CREEK GROUP.

This is the farthest out group, being really on Leichhardt waters.

Fuchsia (M.L. 326).

Mgr., Allis.

LOCATION, ETC

The Fuchsia is on Charley's Creek, 17 miles north-west-by-north from the Springs Camp.

Its area is 5 ac. The lease is under option to the West Cloncurry Copper Company. It is unworked.

ORE-BODY.

SOLDIER'S CAP.

Soldier's Cap is a typical mesa of Desert Sandstone resting on tilted slates of much greater age. The Cap is situated 17½ miles south-east of Cloncurry. The Mount Wheeler leases are on its eastern flanks, the other mines lying chiefly to the north-east.

MOUNT WHEELER GROUP.

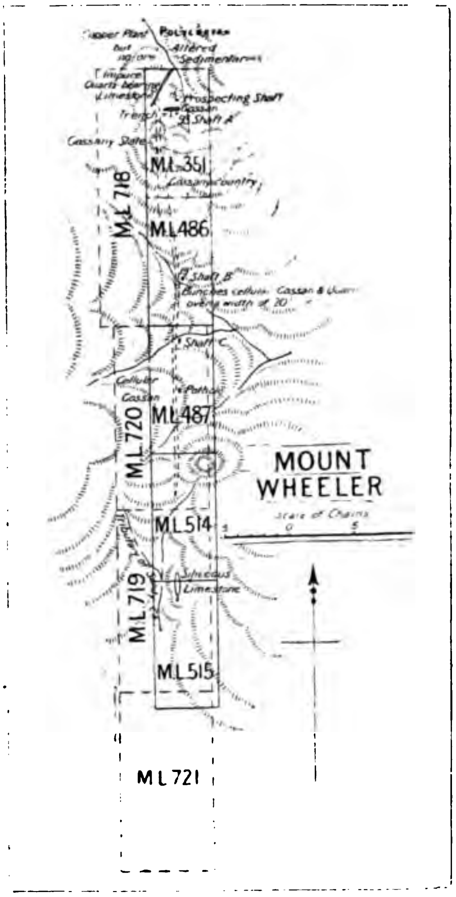
Included here are only those holdings actually seen or concerning which some particulars are available. The following have been omitted:—Forty-second (M.L. 605), Mount Lookout (M.L. 687), Ivy (M.L. 730), Sunrise (M.L. 613), Slate Hill (M.L. 725), and Chalkogen (M.L. 668).

Mount Wheeler (M.L. 351, Etc.).

Mgr., W. Paton.

LOCATION.

The Mount Wheeler leases lie on the eastern slopes of Soldier's Cap, 25½ miles south-east of Cloncurry, the distance by road being



32 miles. The country to the north of Soldier's Cap is beautifully rounded with rolling hills extending out to the rolling downs about 7 miles to the east.

AREA.

The surveyed leases are five in number, and each is 5 ac. in extent. They are from north to south: 351, 486, 487, 514, and 515.

Just before my visit application had been made to have the last three cancelled in order that three leases (Nos. 720, 719, and 721), each of 10 ac., might be repegged slightly to the west, but overlapping the old leases. At the same time application was made for a lease of 15 ac. (No. 718) to the west of Nos. 351 and 486. Though Mr. Paton gave cordial assistance, we had considerable difficulty in determining the extent of the old leases and the new ones had not yet been surveyed.

LITERATURE.

For title of report see Introduction.

(12) Mr. Waller says:

> The lode is a very large one: it is composed partly of gossan and ironstone and partly of dolomite and quartz, and occupies a zone of shearing in diorite. . . . It is stained with carbonate of copper at numerous points. The principal outcrop of ore is at the north end, where the zone of shearing is at least 200 ft. wide. The copper is contained in a seam of ironstone 6 ft. thick, crossing this formation almost at right angles. . . . The lode has been broken into in the bottom of this shaft, and carries 10% of copper ore for a width of 5 ft. . .

DEVELOPMENT.

M.L. 487.—A pothole 3 ft. deep has been opened on the hilltop near the centre of the lease, and the C shaft, 19 ft. deep, is in the gully near the northern boundary.

GEOLOGY.

The country here, with the exception of the Desert Sandstone forming the upper part of Soldier's Cap, comprises highly altered sedimentaries, but the occurrence of the pneumatolitic mineral tourmaline* at the Shamrock gold mine, less than 2 miles to the north-north-west, proves that deep-seated igneous intrusion has taken place, this mineral resulting from after actions of the cooling magma.

There is consequently some reason for believing that the accumulations of copper ore may be due in part at least to the consequent activity of ascending solutions.

The leases are strung on a gossan-stained zone traceable in a general north and south direction from near the northern end of M.L. 351 into the middle of M.L. 514. On the continuation of the line a large crop of siliceous limestone crosses the southern boundary of M.L. 514. This, with the general character of the outcrops and the frequent occurrence of limestone in the ferruginous zone to the north, must be taken as evidence simply of the zone being the outcrop of a sedimentary stratum, and the presence of copper-iron ores in it is to be explained by the comparatively easy solubility of the limestone allowing of deposition of those ores even if it had no precipitative action on uprising solutions.

The main gossan crop in M.L. 351 runs out at right angles to the ferruginous zone, and is presumably on a joint or fissure.

ORE-BODIES.

M.L. 351.—The ferruginous zone may be taken to commence on the southern side of a north-north-east striking crop of quartzite, north of which no sign of ore other than abundant copper grass (*polycarpæa*) has been found. In this lease the zone consists of gossany slate, and in the southern part is a chain in width.

The trench to the west of shaft A exposes decomposed country, with stains and bunches of ore and gossan. A trial parcel was sent from here by the original prospectors (Pearce and McMorn), but no particulars are available as to its value.

A cross crop of slightly copper-stained gossan runs for over a chain east from the northern end of the zone above referred to, and bulged out to several feet in thickness at the eastern end.

---

* The tourmaline occurs both in quartz and as masses of acicular crystals in granular and crystallised calcite, in which there are also occasional splashes of chalcopyrite and crystals of pyrite. Scheelite has been reported from here, but my search for the mineral was unsuccessful.

The old vertical part of shaft A went through this lode, while the underlie was sunk above it, but the well at the bottom of the latter proved 6 ft. 6 in. of ore, dipping 1 in 1 to the south. The ore at grass, about 15 tons, is granular limonite, with concentric light and dark blue chrysocolla in cavities, and stains of malachite on cracks. Native copper and gold have also been found in the more gossany parts. The ore runs up to 15% copper.

My rough surface sample from the heap at grass consists chiefly of dense earthy turgite and limonite, in which are occasional cubical casts of gothite after pyrite. Atacamite, malachite, and dioptase in very small quantity are scattered through the limonite, and they are also found as interlacing stringers, 1/16-in. thick, and have sometimes been deposited in drusy form in cavities, the atacamite in a few cases forming crystalline aggregates, projecting ⅛-in. from the wall. Mammilated chrysocolla fills most of the openings in the denser limonite, and also stains secondary silica; it varies in colour from very light to sky blue, in the former case being lustreless and very absorbent, in the latter vitreous and non-absorbent. A thin film of secondary silica has been deposited on the walls of open spaces in the more cellular gossan, and hyalite coats the surface of chrysocolla in the larger incompletely filled spaces. The sample contains (Government Analyst):

Copper	10·6%.
Gold	1 dwt. per ton.
Silver	2 dwt. 20 gr. per ton.

The prospecting shaft to the north of shaft A was begun on a formation 6 ft. wide and consisting of altered country with irregular bunches of gossan carrying chrysocolla connected by veins. The for-country rock, after which replacement of the calcite by chalcopyrite has taken place. That the pyrite is residual from the leaching of chalcopyrite is indicated by its cellular structure, by the absence of limonite (showing that oxidation of the iron has not taken place) and by the presence of selenite, the result of the action on calcite of the sulphuric acid produced during the oxidation of the sulphide (Fig. 23).

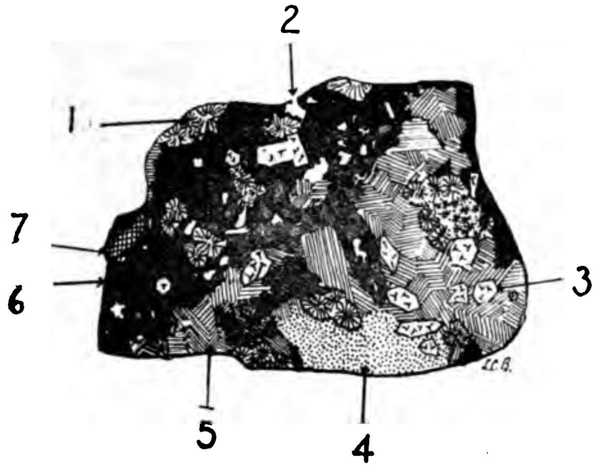


FIG. 23 (NATURAL SIZE).—PYRITIC ORE IN SLATE, B SHAFT, MOUNT WHEELER.

1. *Chlorite.*
2. *Cavity.*
3. *Quartz.*
4. *Country rock.*
5. *Cloudy calcite.*
6. *Pyrite (leached chalcopyrite).*
7. *Selenite.*

Just across the creek, to the south of shaft B, quartz-bearing cellular gossan appears, as irregular crops up to 5 ft. wide and 10 ft. long, in which slight stains of malachite can be seen. A gossany belt 6 ft. wide can be followed south from here.

M.L. 487.—The belt in the northern part, besides being ferruginous, shows considerable kaolinisation. Some bunches of finely cellular gossan were struck in shaft C, just to the south of which crops of that material—evidently irregular bunches—occur over a width of 20 ft.

The pothole on the hilltop to the south is on a crop of slightly copper-stained cellular gossan, 5 ft. and possibly more in width and 1½ ch. in length. Some inclusions of limestone can be seen, but little or no quartz. The gossany belt continues southwards. The sinking of a shaft here is most advisable, as indications are in favour of downward leaching and concentration of copper having taken place. The gossan seems to occur in detached lenses in the belt, and are to be prospected for by driving and cross-cutting.

M.L. 514.—The ferruginous zone continues a few chains into this lease, but no ore-bodies have been exposed. A second iron-stained zone, some chains to the west, is reported to run for miles to the south-south-west.

The limestone crop at the southern end of the lease is on the line of the ferruginous zone, though not visibly connected with it. It is 2½ ch. in length, over a chain in width, and rises 30 ft. above the ground. It consists of granular calcite, slightly coloured internally by oxide of iron and weathering slightly on the surface a dark-brown. Through it are scattered roughly developed elongated quartz crystals of all sizes, quartz being also present as massed crystals and as veinlets. A very little gossan is visible, but only minute traces of copper minerals. The greater part of the limestone is too siliceous for use as a flux, and, as the copper is not likely to increase with depth, the crop is apparently of no value. The limestone may either have been chemically precipitated on a zone of fracture, and therefore be an integral part of an ore-body, or may be a highly altered body of impure limestone—the latter being the more probale origin.

M.L. 515.—The limestone crop above described continues for over a chain into this lease, but no ore-bodies have been discovered. The limestone crop was pegged out 20 years ago by F. Wheeler for gold (?). On the summit is a depression filled with angular boulders, apparently a fallen-in cave, but its regular sides point to the possibility of its having been excavated by the early prospectors.

Shamrock (M.C. 184).

Mgr., Williams.

LOCATION, ETC.

The following is the result of partial analysis of a rough sample (Government Analyst):

Gold ... ... = trace (less than 9 gr. per ton)
Silver ... ... = 2 dwt. 9 gr. per ton
Magnesia... ... ... = 0·95%
Tungstic Acid ... ... = nil.

About 5 ch. north of the Shamrock workings traces of copper are visible in segregations of quartz and calcite occurring in crystalline sedimentaries.

May Graham (P.A. ?).

Mgr., Need.

LOCATION, ETC.

The May Graham is 4 miles west of Soldier's Cap.

Its area is 10 ac. This lease was not visited by me, owing to the inaccessibility of the workings.

The three opencuts—50 ft., 15 ft., and 17 ft. deep—have been allowed to fall in.

OUTPUT.

The Warden gives only:

1905 ... $9\frac{12}{20}$ tons.
1906 ... 1 ,, (but $20\frac{8}{10}$ tons, Need, Elder.)

Mr. Need, the manager, states that he has shipped:

Total—60 tons, averaging 30% (16 to 38%).

ORE-BODY.

The May Graham is reported to be a formation 2 ft. wide, in which occur bunches of ore consisting of oxidising chalcopyrite, chalcocite, cuprite, and native copper; and one specimen shown me contained molybdenite.

Weatherley (M.L. 699).

LOCATION, ETC.

The Weatherley lies 1 mile from the Government Well, and $2\frac{1}{2}$ miles north-east of Soldier's Cap.

Its area is 10 ac. The Federal Reward Copper Company now holds the lease. The mine was idle during my visit, and was therefore not visited.

A trench 10 ft. deep is the only development.

OUTPUT.

2 tons shipped carrying 19% copper and 4 dwt. 18 gr. per ton gold.*

ORE-BODY.

A formation 7 or 8 ft. wide is said to carry copper, besides which there is ironstone and a heavy body of ferruginous quartz.

---

* *Vide* Federal Reward Copper Company's prospectus.

King Fisher (M.L. 700).

LOCATION, ETC.

The King Fisher lies 1½ m. north-east of Mount Wheeler.

Its area is 20 ac. Now the property of the Federal Reward Company.

One trench, 12 ft. deep, has been opened.

OUTPUT.

2 tons shipped, carrying 25¾%.*

Mackinlay (M.L. 698).

LOCATION, ETC.

The Mackinlay is about 10 miles north-east of Soldier's Cap and ½ mile from Sandy Creek. It is shown incorrectly on the lease map.

Its area is 40 ac., and it is the property of the Federal Reward Copper Company. Not visited.

There is a shaft on southern boundary.

OUTPUT.

½ ton shipped, carrying 33% copper.*

ORE-BODY.

There is reported to be a carbonate-bearing formation 8 ft. wide, beside an ironstone gossan.

ROBERTS CREEK GROUP.

The Roberts Creek Group lies to the north-east of Soldier's Cap. None of the mines were visited, and it is doubtful if any are being

MARTIN CREEK.

The Martin Creek Groups lie between those on Duck Creek, the Florence River, and Soldier's Cap. The district attained some notoriety over the flotation of a gold mine, but has not yet produced much copper. Owing to the limited time available, the mines were not visited by me.

MOUNT McCABE GROUP.

This group includes only three leases.

Mount McCabe (M.L. 363).

Mgr., Pearson.

LOCATION, ETC.

The Mount McCabe is 3 miles east of the Cloncurry River and 2½ miles north of the old Last Call gold mine, which is 24 miles south of Cloncurry.

Its area is 10 ac. The lease is held on option by the West Cloncurry Copper Company, Limited, which began operations early in this year (1907).

LITERATURE.

For title of report, numbered as below, see Introduction.

(16) Mr. Bedford wrote as follows:

> This is one of the two true fissure lodes, or, rather, lode channels, on the field. The channel runs south-west and north-east, is 35 ft. wide and quite 800 ft. long. The metal is carried as black oxide in the veins, in a soft chlorite schist, but there are outcrops of specular iron also in the lode channel, which carry low-grade carbonates. Near the summit of the hill an opencut 8 ft. deep and about 6 ft. wide shows a few fine veins of black oxide of copper, but the schists are also impregnated with copper to an appreciable extent. There are many outcrops of iron present, principally specular, and a little as hematite and siliceous limonite. At its lower or northern end the ore channel is cut off by blows of carbonate of lime, which are heavily copper stained at intervals to the base of the hill. . . . A shaft is now down 60 ft., of which the last 45 ft. is in boulders of iron faced with malachite.

ORE-BODIES.

Mr. Cherry, the Gold Warden, after seeing the property, wrote: "The main outcrop strikes northerly and can be seen for a distance of over 200 ft., having a width of from 20 to 40 ft. The lode is composed of kaolin, limestone, and slate carrying copper, while seams of red oxide can be traced through the general formation. . . . Mr. Pearson informs me that the main lode bulks 12·64%."

From the manager's reports it is learnt that in sinking the shaft thin veins and nodules of schist were found to a depth of between

50 ft. and 60 ft., these giving place to "small veins of irony ore through the chlorite schist. A bulk assay from 65 ft. gave a return of 4·4% copper" (8/3/07).

OUTPUT.

1906 ... 4 tons shipped.

McCabe's Hill (M.L. 444).

Mgr., McCabe.

LOCATION, ETC.

McCabe's Hill is located within the catchment of Martin Creek, but its exact position is not known to me.

Its area is $9\frac{8}{10}$ ac.

OUTPUT.

1905 ... 19 tons shipped.

Vulcan (M.L. 268).

Mgr., Entriken.

LOCATION, ETC.

The Vulcan lies 1½ mile north-west of the old Last Call Gold Mine.

Its area is 10 ac.

OUTPUT.

The Warden, in August, 1905, reported:

51 bags, valued at	£18	7	3
68 ,, ,,	21	13	8
47 ,, ,,	26	11	10

1906, 7 tons shipped.

ELDER CREEK.

The Elder Creek groups lie between Cloncurry and Soldier's Cap. Little or no work was going on here at the beginning of 1907, and none of the mines was visited. The ore deposits are reputed to be small and of little account.

MOUNTAIN HOME GROUP.

The group centres in the freeholds on Mount Norma, or Norna, and contains, besides those given below, the Come by Chance (M.L. 651), of which no particulars are available.

Mountain Home (M.F.s 2822, 2823, 2821, 2820, and 2659).

LOCATION, ETC.

Mountain Home (M.F. 2821) is on the southern slopes of Mount Norna, which lies 17 miles south-east of Cloncurry; M.F. 2823 is on the northern slopes of the same mountain; M.F. 2822 is ½ mile to the north-north-east; M.F. 2820 is 3 miles north-east of Mount Norna; and M.F. 2659 is ½ mile north of M.F. 2820.

The following are the areas of the blocks:—2821, 2823, and 2822 are each 160 ac.; 2820 is 120 ac.; and 2659 is 40 ac. in extent.

OUTPUT.

1906 . . 14$\frac{19}{20}$ tons shipped.

LITERATURE.

For titles of reports, numbered as below, see Introduction.

(2) Mr. Jack's description is as follows:

> ***Mountain Home.***—Mount Norma lies about 10 miles south-east of the Gilded Rose. It is a very conspicuous hill, especially as seen from the Hughenden road. It is of vertical slate (or rather shale) with a north-west strike, and is intersected with reefs or veins of quartzite. On its eastern side is the Mountain Home Copper Mine. The mine is one of the quartzite reefs above referred to, which runs north-north-west and is almost vertical, but has a slight underlie to east-north-east. The reef is seamed with copper ore, especially in the back (up hill). In the upper part of the lode, where the reef stands up like a wall on the hill side, the copper ore is represented by stains (stalactitic coatings) of green carbonate. The lode is a peculiar one in many respects, from the association of minerals. It yields green carbonate of copper, ferruginous red oxide of copper, enclosing numerous garnets, asbolane (manganese and cobalt) and numerous dendritic markings in binoxide of manganese.
>
> From the hardness and toughness of the siliceous matrix of the ore, the Mountain Home will probably be an expensive mine to work, but I should expect it to have a large output of ore of good quality. The labour conditions necessary for securing the land have been fulfilled for the most part by the construction of a dray road up the hill; and the mine is very little opened out.

(7) The following is taken from Mr. Rutherford's report:

> The Mountain Home (M.F. 2821) Mine is situated half-way up the eastern side of Mount Norma, a conspicuous hill 18 miles south-east from Cloncurry in a direct line. The "mine" consists of a 6 ft. by 4 ft. shaft sunk vertically 10 ft. and then 40 ft. on an underlay of 70 degs. to the east. The *raison d'être*

of the shaft is an irregular crack in the ferruginous sandstone, which is about 1 ft. wide at the surface, but peters out before the bottom of the shaft is reached. This probably carried copper; plentiful stains on the rocks at surface on the sides of an irregular excavation indicates the removal of a certain amount of ore from what must have been a bunch occurring at the surface. No other indications of ore were seen in the vicinity.

Lady Norma (M.L. 694).

Mgr., W. Carroll.

LOCATION, ETC.

The Lady Norma is on O'Toole Creek, 16 miles from the railway.

Its area is 20 ac. The Federal Reward Copper Company now holds the lease.

There is one shaft 50 ft. deep.

ORE-BODY.

There is reported to be a large crop of ironstone gossan and copper carbonates and 3 ft. of ore in the shaft bottom.

Elder Bornite (701).

Mgr., W. Carroll.

LOCATION, ETC.

The Elder Bornite is on the Elder River, 18 miles east-south-east of Cloncurry, 2 miles south of the Winton road, and 7 miles north-east of Mount Norma.

Elder (M.L. 415).

Mgr., Wright.

LOCATION, ETC.

The Elder is located on the creek of the same name. Its area is $9\frac{8}{10}$ ac.

OUTPUT.

1906	...	$20\frac{8}{20}$ tons.

Three Jokers (M.L. 463).

Mgr., Moniz.

LOCATION, ETC.

The Three Jokers lies 4 miles west of Mount Norna. Its area is $9\frac{8}{10}$ ac.

OUTPUT.

1905	...	$3\frac{10}{20}$ ons
1906	...	4 ,,
Total ...	...	$7\frac{10}{20}$

PUMPKIN GULLY.

This group is on the main Richmond road, between Cloncurry and the open downs to the east. A little work is occasionally done here, but, as most of the holdings were under exemption at the end of last year, it was not thought worth while to pay a special visit to the locality. The only workings seen, therefore, were those in immediate proximity to the road.

From my own rapid traverse of this part of the district the opinion was formed that it is an area of considerable metamorphism, chiefly of sedimentaries (including limestones), though eruptives are not wanting. The strata are tilted and the quartzites are interbedded with the slates.

Metamorphism has been less intense here than in any other part of the Cloncurry district—traces of fossils (*Stromatopora*) being distinguishable in the limestones. This may furnish an explanation of the comparatively small size of the ore-bodies—viz., that concentration of the copper has not been brought about owing to the original cupriferous silicates of the eruptives not having been broken up.

The following quotations may prove of interest, though not in agreement with my views.

(2) Mr. Jack refers in the following terms to the Pumpkin Gully country:

> Eastward towards the Mount Douglas mines, similar country prevails, with the addition of peculiar rugged knobs of granular quartzite. Unless these latter be the dicharge-pipes of "geysers" which poured out hot water containing silica in solution. I am at a loss to account for them.
>
> On the north bank of *Pumpkin Gully*, a copper lode (nearly vertical) runs from south-west to north-east. It has a large cap of red ironstone, and green

> The remaining leases in this neighbourhood show numerous patches of good ore in seams in the bedding planes of the country rock, but the outcrops are detached, and without, in many cases, even the removal of the loose boulders and *débris* of the weathered country rock, it is impossible to judge of their extent or their connection with each other. As far as I could see, none of them are indicative of true fissure lodes, but they are all apparently veins or impregnations of the country rock.

(7) Mr. Rutherford sums up:

> This group consists of small outcrops of quartzite, almost invariably associated with oxide of iron and stained with copper carbonate. They occur in country which is comparatively flat in schists and slates, and always follow the bedding of those rocks. The ridges in the vicinity are composed of sandstone often altered to quartzite, but still showing bedding. This rock, on examination, almost invariably shows stains of copper carbonate. It is my opinion that the copper has been leached out of this overlying sandstone and redeposited in a concentrated form along foldings and bedding planes of the underlying schists and slates. In no case did I see indications of fissure lodes. These small pockets, occurring as they do above water-level, are excavated without much expense, and, owing to the extraordinary richness of the ore, this pays to be carted to the railway. I consider the Homeward Bound group of leases of little value, as in most cases the ore bodies seem to have been mostly removed.

HOMEWARD BOUND GROUP.

This group includes the south-western leases.

Homeward Bound (Extended M.C. 331).

Mgr., Brown.

Location, Etc.

The Homeward Bound lies about ½ mile east of Pumpkin Gully, and 12 miles east of Cloncurry.

Its area is 600 ft. by 350 ft. This claim and two small leases (Mount Douglas and Flying Dutchman) have been pegged out on the abandoned Homeward Bound lease.

Literature.

For titles of reports see Introduction.

(2) Mr. Jack says only:

> Three hundred yards east of the Flying Dutchman is the *Homeward Bound* Copper Lode. It runs north and south. The shafts have become unsafe, but a little of the ore is lying about—green and blue carbonates, and some red oxide and native copper. The copper ore is said to have contained gold. A good deal of ore from this mine is stacked at the Queensland machine.

(4) Mr. Cameron wrote of the original holding:

> *Lease No. 158* shows an outcrop of ore called the Homeward Bound. An excavation about 30 ft. by 20 ft., and perhaps 6 ft. in depth, has been made on the surface of the ground, and good ore is reported to have been obtained from a shaft on the south-east corner of the excavation. At the north-west corner of this excavation a shaft has been put down 75 ft., and a drive from the south-east corner of the shaft goes east 30 degs. south for 17 ft., and then north 30 degs. east for 15 feet. There are highly-inclined slates striking about north-east in the shaft, and crystallised limestone and felspathic sandstone in the drive. There is no sign of ore or lode material. Ore is at present being obtained on the surface some 30 ft. east of this shaft, and about 20 tons have been stacked. The ore occurs as blebs of red oxide, glance, and radiating

fibres of green carbonate in a siliceous matrix or quartzite. I could see no indications of a well-defined lode, nor does there appear at present to be any great body of ore. The outcrop is, however, considerably hidden by surface accumulations. An ore purchase-note from the Queensland Smelting Company, shown to me by Mr. Henry, as of ore from this outcrop, gave a return of 27·95 per cent. copper for a bulk sample of a few tons. The ore stacked could be easily picked to give a considerable amount of ore of this value. A few shallow trenches and shafts along the apparent line of deposition of the ore would soon serve to show whether the ore-body is continuous for any distance. The drive from the shaft mentioned above if continued a few feet would indicate whether the ore-body reaches down to the 75-ft. level, or whether it is merely a lenticular patch of ore at the surface of the ground.

In the north-west corner of Lease No. 158 is another outcrop of copper ore on which a pit some 18 ft. deep has been sunk. It shows ferruginous and cupriferous quartzite apparently occupying a fissure striking about north 20 degs. east and dipping steeply to east 20 degs. south. The lode is about 2 ft. wide, and shows good copper ore. This lode is generally supposed to be a continuation of the Homeward Bound, though on what evidence I have been unable to determine.

There is another shaft some 300 yards south-west from the Homeward Bound, but it has tumbled in. Some ferruginous green and blue carbonates with splashes of red oxide are seen on the surface.

(7) Mr. Rutherford states:

An irregular excavation 30 ft. x 20 ft. and 4 ft. to 6 ft. deep has been made to remove this outcrop, from which 200 tons of rich ore are said to have been sent away. According to Mr. Henry, none of this ore assayed under 39 per cent., and was mostly carbonate and an intimate mixture of carbonate and glance (the result of oxidation of the glance) known locally as grey ore. . . . In the south-east corner of the surface excavation an irregular hole has been sunk 12 ft. and a drive put in to north 45 degs. west for a distance of 20 ft. I was able to examine this drive, and found it to be in a felspathic sandstone showing green stains of copper carbonate on roof and sides leached out of the overlying outcrop, but I saw no ore nor lode formation. This seems to have been a lenticular deposit of rich ore at the surface. With the exception of a few tons lying at grass, all the ore seems to have been removed.

Flying Dutchman (M.L. 418).

Mgr., Crabb.

LOCATION, ETC.

The Flying Dutchman lies 10 ch. to the west of the Mount Douglas.

Its area is 5 ac.

LITERATURE.

For titles of reports see Introduction.

(2) Mr. Jack's report is as follows:

> Half a mile to south-south-east is the *Flying Dutchman.* It runs east and west and underlies to the north. The country is sandstone, with fine grains of mica. The matrix of the lode or reef is sandy (siliceous). The mine was originally taken up as a gold reef, and Mr. Macphail informed me that the stone, when crushed at the Queensland machine, averaged 1 oz. 3 dwt. of gold to the ton. All that remains to be seen at the shaft is a quantity of glassy quartz, with green fibrous (radiated) carbonate of copper, and some grey copper ore.

This probably refers to the western shaft on the Homeward Bound.

OUTPUT.

1904 ... 18 tons, shipped by Crabb; source doubtful.

King John (M.L. 417).

Mgr., Miller.

LOCATION, ETC.

The King John adjoins the old Homeward Bound on the north-west.

Its area is 5 ac.

Baroondah (M.L. 137).

LOCATION.

The Baroondah lies ¼ mile east of the Copper Quarry.

LITERATURE.

For titles of reports see Introduction.

(4) Mr. Cameron reported:

> *Lease No. 137* shows an excavation about 12 ft. long by 9 ft. broad and 5 ft. deep, from which some 3 or 4 tons of ore showing copper glance and carbonates in a quartzite gangue have been taken. About 140 yards to north 75 degs. west from this excavation is a trench, 5 ft. long by 3 ft. broad and 5 ft. deep, which exposes about 2 ft. of siliceous ore carrying ferruginous green carbonates. The country rock is siliceous schist.

(7) Mr. Rutherford reported:

> It shows an irregular excavation about 12 ft. long by 5 ft. deep in siliceous schist, from which a few tons of ferruginous quartzite stained with copper have been removed and are lying at grass. On the same lease 200 yards to the south-east 7 tons of 30 per cent. ore have been sent away from the surface.

Musical Union (M.L. 465).

Mgr., Brown.

LOCATION, ETC.

The Musical Union lies 1 mile south-east of the Copper Quarry. Its area is 5 ac.

Burleigh (M.L. 136).

LOCATION.

The Burleigh lies 1½ mile south-east of the Homeward Bound. It is now abandoned.

LITERATURE.

For titles of reports see Introduction.

(4) Mr. Cameron remarks:

> *Lease No. 136* shows a low ridge of hornblende rocks and limestone striking about north-west. Several small outcrops of copper ore are seen, but so far they do not appear to be of any great importance. The ore is chiefly peacock ore with earthy green carbonate and iron oxide, and occurs associated with quartz and calcite in what are apparently small veins following the bedding of the country rock.

(7) Mr. Rutherford wrote:

> It shows on the surface small veins of quartz carrying iron and a little copper, principally in the form of peacock ore. Several small trenches have removed most of the ore. The country is hornblende schist, and the quartz follows the bedding of the rock to north 30 degs. west.

Copper Quarry (M.L. 143).

Mgr., Brown.

LOCATION, ETC.

The Copper Quarry is 9 miles east of Cloncurry, and about ½ mile east-south-east of where the Richmond road crosses Pumpkin

Raleigh Heights (M.L. 373).

Mgr., Carew.

LOCATION, ETC.

The Raleigh Heights lies 5 ch. to the north-north-west of the Copper Quarry. The Richmond road crosses the southern corner of this lease.

Its area is $9\frac{8}{10}$ ac.

LITERATURE.

For title of report, numbered as below, see Introduction.

(4) Mr. Cameron wrote of the old lease:

> *Lease No. 139* shows a prominent ridge of altered and vertical felspathic sandstone about a quarter of a mile in length. A few potholes expose indications of copper here and there through the sandstone, but do not disclose any ore of value.

(7) Mr. Rutherford says:

> This area is taken up to include a metamorphosed sandstone ridge running north 80 degs. east. The sandstone is stained in places with green carbonate. A small hole into the side of the hill is completely cleaned out of any ore which it may have contained. I examined the whole ridge, but saw nothing beyond a few stains as mentioned.

EAGLEHAWK GROUP.

This group lies to the north of the Homeward Bound.

Eaglehawk (M.L. 454).

Mgr., Miller.

LOCATION, ETC.

The Eaglehawk lies 3 miles west of the 18-Mile Hotel on Fisher's Creek.

Its area is 5 ac.

LITERATURE.

(4) Mr. Cameron wrote of the old lease:

> *Lease No. 48* shows a pit sunk about 12 ft., on what is apparently a north-west and south-east lode. About 12 tons of ferruginous siliceous lode material containing large blocks of copper glance have been stacked. The width of the lode cannot be judged of, nor has its continuation been proved by prospecting work.

OUTPUT.

1906 ... 10 tons shipped.

Crow's Nest (M.L. 455).

Mgr., Miller.

LOCATION, ETC.

The Crow's Nest lies ½ mile south-south-west of the Eaglehawk.

Its area is 20 ac.

Salisbury (M.L. 142).

LOCATION.

The Salisbury lies 1 mile north-east of the Homeward Bound and within 5 ch. to the north of the Richmond road. The lease has now been forfeited.

LITERATURE.

(4) Mr. Cameron wrote:

> *On Lease No. 142* a shaft was sunk to a depth of about 20 ft. and a few tons of copper ore extracted. It shows blebs of glance and peacock ore with radiating fibres of green carbonate associated with quartz and calcite. There does not appear to be any great body of ore present, nor is it possible with the present prospecting work to determine the direction in which the ore-bearing material is running.

(7) Mr. Rutherford states:

> This is taken up on a small ferruginous quartzite outcrop showing copper stains. The only work done consists of a shaft, 16 ft. deep, which shows small ferruginous quartz veins following the bedding of the rock. No copper ore is seen in the shaft. The outcrop is said to have been worked for gold.

Cammie (M.L. 477).

Mgr., Miller.

LOCATION, ETC.

The Cammie lies 1 mile east-south-east of the Crow's Nest, and 1 mile west-south-west of the 18-Mile Hotel.

Its area is 5 ac. The ground was deserted in October, 1906.

LITERATURE.

King William (M.L. 462).

Mgr., Miller.

LOCATION, ETC.

The King William is understood to lie 2 miles south-south-east of the 18-Mile Hotel on Fisher's Creek.

Its area is 5 ac.

MONAKOFF GROUP.

This group includes only Freehold No. 15, which is located on a branch of Courtenay Creek, a tributary of the Williams River.

Monakoff (M.F. 15).

LOCATION, ETC.

The Monakoff lies 13½ miles north-east-by-east of Cloncurry.

Its area is 80 ac. The property is now held by the Monakoff Company, which pays a royalty to the Railway Company.

LITERATURE.

For titles of reports see Introduction.

(4) Mr. Cameron wrote:

> *The Monawagh Mine* is a prominent ridge of copper-bearing country, running in a north-east and south-west direction. The south-western portion, which is divided by a watercourse from the north-eastern, presents a wall of green-stained rock to the south-east. I am informed that an opencut at the north-east end of the ridge exposed a vein of copper ore about 2 ft. in thickness, interbedded with the schist. The ore is siliceous and ferruginous and carries copper in the form of glance and tile ore. About 300 yards on the north side of the ridge a trench 35 ft. long, 3 ft. wide, and 8 ft. deep exposes a small lode of siliceous ore carrying bornite and glance.

(7) The following is taken from Mr. Rutherford's report:

> This property . . . consists of a prominent ridge of sandstone still showing bedding in places, and much contorted and altered to quartzite in others. The surrounding country is micaceous schist. Approaching this ridge from the north a lenticular hole 10 ft. deep at its deepest part and 30 ft. long was examined. According to the digger who showed us this property 18 tons of 37 per cent. ore were sent away from this excavation. The ore as usual was associated with iron and quartz. A heap at grass shows the iron impregnated with iron pyrites. Ascending the hill the sandstone ridge is reached. It runs 20 degs. south of east, and is stained in places a bright green with copper salts. Starting at the western end of the ridge along the line of outcrop, the first cutting is 15 ft. long by 12 ft. deep. It shows the sandstone to be soft and ferruginous, and reveals the staining of copper to be confined almost entirely to the upper part of the trench. Continuing east a hole 3 ft. deep is in barren sandstone. A second cutting shows quartzite 3 ft. across stained with carbonate. Beyond this cutting is a shaft which is said to have been sunk 50 ft., but has been filled up with *débris* to within 20 ft. of the surface. An examination of the waste dump showed nothing but the country rock. Farther to the north-east across a gully is a second bed of sandstone very similar to that just described, but no work has been done on it.

CHINAMAN CREEK.

Chinaman Creek occupies a wide flat-bottomed valley, which is bounded on the east by a low table-topped range, and on the west by the Corella peneplain.

CASSIDY' SWELL GROUP.

The group is on the eastern side of the Chinaman Creek valley.

The Poseidon has lately been taken up in the vicinity of the Thistle.

Thistle (Extended M.L. 248).

Mgr., Corney.

Location, Etc.

The Thistle lies 2 miles south-south-east of Cassidy's 9-Mile Well, at the crossing of the Boulia road and telegraph line, on Chinaman Creek.

Its area is 1,200 ft. by 350 ft.

Development.

A costean (No. 1 cut), 5 ft. deep and 7 ft. long, has been opened 2 ch. south-east of the north-western corner peg, and a drive continues 6 ft. from the eastern end. At 1 ch. to the south there is a shallow pothole, 10 ft. beyond which is No. 2 cut. This is angle-shaped, being 6 ft. deep and 4 ft. wide, with one arm running 10 ft. west and another 8 ft. south. A second pothole lies ½ ch. south of No. 2 cut, and the main shaft, ½ ch. to the east, is 70 ft. deep, and has a cross-cut for 34 ft. east at the bottom.

Output.

with azurite and malachite, and containing probably 10% copper and 5% silica, was obtained from irregular joints near the surface. There are only stains of copper carbonate in the drive.

The pothole to the south is in bleached clay-slate, the joints of which have been filled or stained with carbonates, and about 1 cwt. of 5% ore has been picked out. The country between this hole and No. 1 cut is a ferruginous slate, the joints of which are coated with black limonite.

No. 2 cut is in bleached and iron-stained clay-slate, with a little gossan and carbonate and silicate stains on joints. There are, at grass, about 4 tons of 5% ore, and 18 cwt. of 45% ore is said to have been shipped, while the 15 tons in the tip probably contain 1% copper, and may be of value as an aluminous flux.

The shaft is sunk on the eastern side of a formation, 10 ft. wide. There is little probability of anything payable being found here, but the open ferruginous joints indicate the possibility of the formation being copper-bearing towards water level. The result of driving has been disappointing because of faulting throwing the formation, proved in No. 2 cut, back from the shaft.

A tongue, 20 ft. across, of formation, comprising slate fragments in a ferruginous matrix, projects towards the hæmatite crop for 1½ ch. east of the shaft.

The southernmost pothole is in poor siliceous ore.

TOWN.

GREAT AUSTRALIA GROUP.

The group includes chiefly freeholds. The Great Australia is the only lode of importance.

Great Australia (F. Al).

Mgr., G. E. Moore.

LOCATION.

Freehold A1 adjoins the township of Cloncurry on the south, the Great Australia workings lying a mile south-east from the main business area.

The major part of the holding is low-lying, the Great Australia and Mount Pisa ridges forming the most marked rises, and the Wanderer Creek the most noticeable depression.

Of timber larger in size than brush there is of course little left, because of mining and smelting operations in past years, and the needs of the township.

AREA.

The area of the freehold is 640 ac., and it is square, each side being therefore a mile in length.

The property is now in the hands of the Queensland Exploration Company, Ltd., whose manager was absent during my inspection.

HISTORY.

The Great Australia was taken up, as a 640 acre mineral selec-

Towards the end of the year 1906 the Queensland Exploration Company, which had taken over the property earlier in the year, began cleaning up the old workings.

From Press reports it is learned that during the present year the main shaft, south of the big crop, has been sunk 112 ft. (17/4/07), in formation carrying stringers of native copper. The tunnel shaft, 117 ft. deep, appears to have passed through the ore bodies (proved in the adit—L.C.B.), which have been tapped in a western crosscut, 27 ft. long: but the eastern crosscut, 100 ft. long, seems to have failed to locate ore.

LITERATURE.

The full titles of reports will be found in the Introduction.*

(1) The Wardens gave a statement of output, but no account of the deposit worked.

(2) Mr. (now Dr.) Jack describes three lodes:—(*a*) forming the main crop one-fourth of which Mr. Jack estimated would contain 35%; and (*b*) and (*c*) cross lodes. In the last were exposed masses of red oxide of copper often intimately mixed with small nuggets of native copper and occasional crystals of black oxide of copper. The following is the full account:

> The "*Great Australian*" Copper Mine lies between the last-mentioned ironstone hill and the township. It may almost be described as a mountain of copper. It occurs as a ridge about 30 feet in height and over 100 yards in length, with a general trend from north to south. It is intersected by two cross lodes, and has several branches. A detailed description is in preparation. At present I can merely say that numerous trenches and shafts only lead to the conclusion that "there is no end to it." The most valuable ore is the red oxide, which is obtained in great purity, and often contains large masses of native copper. The cap of the lode is composed of a siliceous matrix with green carbonate.
>
> *Lode A.*—The most conspicuous feature of the mine is the outcrop of a lode, which runs north 33 degrees west, and stands up to an average height of about 20 feet above the general level, for about 80 yards. The lode underlies to west 33 degrees south, at an angle of 50 degrees. The matrix is a brownish quartzite, very tough and hard, and frequently enclosing small pieces of native copper, interspersed through the matrix irregularly; but as a rule, in veins parallel to the general run of the lode, are masses of green carbonate of copper and red oxide, the latter often in crystals, and as nearly as may be, chemically pure. The ore has been quarried to a small extent on the crown and south-western side of the hill. If the whole hill were quarried out I believe that on a rough estimate quite a fourth of the entire mass would yield ore containing 35 per cent. of copper and over, after the rejection of the siliceous matrix and portions of ore too much mixed up with the matrix.
>
> *Lode B.*—At the S.E. end of the hill the A lode is shifted about 90 feet to the S.W. by a cross lode (B) whose course is east 40 degrees north. This cross lode is traceable for over 100 yards to the N.E. of the lode A, but the first 20 feet or so are obscured by a talus of *débris* from the outcrop of lode A. Lode B is nearly vertical, but underlies a little to north 40 degrees west. Its most conspicuous feature is a rock, 32 feet in length, 8 feet broad, and averaging 6 feet in height. This rock is a mass of quartzite like that which forms the matrix of lode A, and has joints and pockets coated with

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* Messrs. Jack and Rutherford give particulars of another lode (the Wanderer) on the freehold, but this was not inspected by me.

green carbonate of copper. To west 40 degrees south of the rock and in the same line, the cap of an ironstone and copper lode extends for 17 feet, when it passes under the talus already referred to. At the other end of the rock (to east 40 degrees north), the lode is traceable, either *in situ* or in blocks, for 260 feet. Lode B occurs in a line of fault with a downthrow to the north, and is of later date than lode A.

To the south of lode B, lode A is continued in a general direction of south 10 degrees east, for a distance of about 24 yards. It appears here to be narrower and poorer (at the outcrop) than on the other side of the cross lode, and to bifurcate towards the south end.

Lode C.—The south end of this (which may be called the second section of lode A) is intersected by a second cross lode (lode C) running east 35 degrees north. This lode has been worked open-cast for about 110 feet to east 35 degrees north from the crossing of lode A. The ground rises in this direction, and the present face of the working is about 20 feet high. The lode varies from 2 to 12 feet in width and is nearly vertical. The faces and sides of the workings expose masses of red oxide of copper of great purity, often intimately mixed with small nuggets of native copper. Occasional crystals of black oxide of copper are met with in this cutting. The oxide is traceable for a considerable distance beyond the working.

What may be called the third section of lode A extends in a general direction of south 15 degrees east from lode C. It has been worked open-cast for about 50 feet from the crossing of lode C, and has yielded much rich ore. The south face of the open-cast shows a mass of very pure red oxide bound together by masses of native copper.

From this open-cast no work has been done for the next nineteen feet (though the lode is visible on the surface), when an underlie shaft has been sunk on it, in rich ore. The lode is untouched for about 40 feet from the shaft, when it is again worked open-cast for a distance of 90 feet. The workings here have tumbled in, but enough is still seen to prove that the lode continues undiminished in size, and yields rich oxide ores.

(4) Mr. Cameron brings Dr. Jack's description up to date 1900 thus:

Since Mr. Jack's visit an open cut has been worked along the centre, and apparently the richer portion of the main outcrop mentioned as Lode A, starting from its north-western termination and going in a south-westerly direction along the line of lode. The open cut is about 15 feet across, and starts from a point about 20 feet above the base of the outcrop. It runs in a south-easterly direction for about 70 feet, ending

I was unable to get any reliable information as to the value of the ore in the lower levels, but it appears that the water level was reached and sulphide ore obtained. The smelting of the ore seems to have been the difficulty that was never satisfactorily overcome, and this failure, together with the drop in the price of copper, are the causes to which is attributed the closing down of the mine.

(6) Messrs. Rutherford and Kitchener in describing the geology of the No. 1 Freehold, say:—

> The country is flat and consists of felspathic slate standing nearly vertical. Overlying the slate and scattered irregularly over the surface is a metamorphosed sandstone highly contorted and completely altered to quartzite in places. The ore occurs (1) in a bed of vitreous yellow quartzite, which stands up 30 ft. above the general level for a distance of 80 yards, and (2) in the slate associated with iron oxide and quartz in a succession of lenticular deposits to the south-west. . . . It is possible some rich pockets of ore may still remain undiscovered, but the expenditure which would be entailed prospecting for these would be greater than any return which could legitimately be expected.

(12) Messrs. Alex. Hill and Stewart gave few details beyond the amount of seconds at grass and the contents.

DEVELOPMENT.

The Great Australia workings comprise three opencuts, an adit and nine shafts. Only the northern cut, the adit and tunnel shaft were accessible to me.

The northern opencut, on the big crop, is 30 ft. long, 20 ft. wide, and 10 to 15 ft. deep.

The main opencut, to the south-east of the big crop, and between the main northern and Tangye's shafts, really represents stoping done from the water-level.

Tangye's opencut is a fallen in stope to the south of Tangye's shaft.

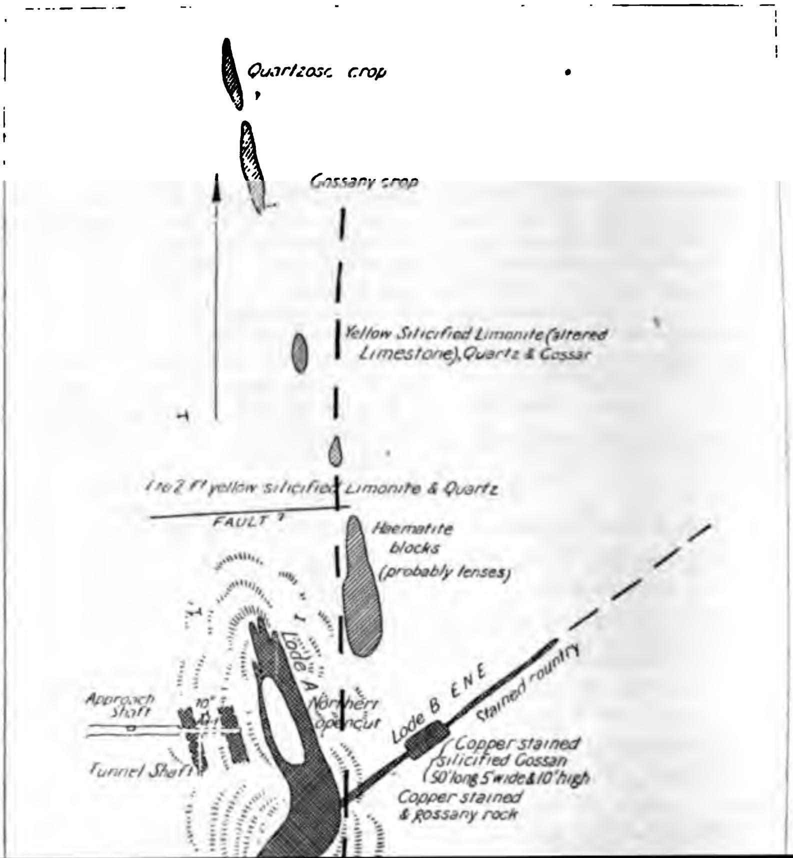
The southern opencut, a chain in length, also represents collapsed stopes south from Pascoe's shaft.

The adit, which is 15 ft. wide and 8 ft. high, was opened on the western side of the main crop, evidently with the idea of testing it beneath the surface. The approach is a chain in length, and the adit itself 40 ft. At 12 ft. from the mouth of the adit a drive runs southwards for 25 ft. to the Tunnel shaft.

The Approach shaft is an old one half-way along the approach to the adit on the northern side.

The vertical Tunnel shaft, 6 ft. by 3 ft., 25 ft. south of the adit, was left when 50 ft. deep by the former holders. The present management had at the time of my visit cleaned it out, and continued it to 57 ft. below the surface, and had begun a crosscut (12 ft.) to the west, at the 50 ft. level.

The Northern shaft, a chain to the south-east of the main ore body, and 3 ch. south-east of the adit, is 100 ft. deep, and is now inaccessible. There is understood to be at 70 ft. depth a short drive northwards, and one southwards to Tangye's shaft, above which the ore has been stoped to the surface.


Quartzose crop
Gossany crop
Yellow Silicified Limonite (altered Limestone), Quartz & Gossan
1 to 2 Ft yellow silicified Limonite & Quartz
FAULT ?
Haematite blocks (probably lenses)
Lode A
Northern opencut
Approach Shaft
10° Dr
Tunnel Shaft
Lode B E N E
Stained country
Copper stained silicified Gossan 50' long 5' wide & 10' high
Copper stained & gossany rock

Tangye's underlie shaft (inaccessible), 1½ ch. south-south-west of the Northern, is 160 ft. deep, the main levels being at water-level (75 ft. below the surface), but there are believed to be shorter drives at a still greater depth. The old stopes to the south have now collapsed.

The underlie Air shaft is 1½ ch. south of Tangye's, but is inaccessible, and no particulars are available as to its depth.

Pascoe's underlie shaft, 1 ch. beyond the air shaft to the south, is 70 ft. deep. The old stopes, extending for a chain south of this shaft, have now fallen in forming an opencut.

Henry's old vertical shaft, to be known in future as the Main Engine shaft, lies ½ ch. south-south-west of Tangye's shaft. This was sunk a few feet below water level (70 ft.) by Henry, and under the present management had, when seen by me in January of this year, been cleaned out 15 ft., and cut down to 10 ft. by 4 ft. in the clear.

Henry's southern vertical shaft (inaccessible) 1½ ch. south-south-west of Pascoe's, is 80 ft. deep, and at the bottom there are levels 60 ft. north and 50 ft. south.

Output.

No records prior to 1884.

1885—253 tons ore, yielded	60 tons copper
1886	200 ,, ,,
1887	190 ,, ,,

The Warden mentions that 1,340 and 1,010 tons of ore were raised during the years 1885 and 1887, but makes no reference to any output in 1886 and 1888. The total raised probably exceeded 3,000 tons.

The ore now at grass is stated to be 740 tons, and its average contents is, according to Messrs. Alex. Hill and Stewart, 13·12% copper.

The seconds from the opencut amount to 130 tons, averaging 8·8% copper.

Geology.

Country.—The country rock west of the workings dips westwards and consists of schist, that to the east dips east-south-east, and comprises highly altered sedimentaries, with lenses of spotted calcite. The spots in the calcite represent crinoid joints, and indicate its organic origin.

Lenses of limestone, 2 ch. in length and 6 ft. wide, have been worked in shallow quarries ¼ mile north of the mine. The rock consists, with the exception of a few bands, of pure crystalline grey marble. There are indistinct indications of crinoid joints, proving its sedimentary origin—as against secondary segregation from the country rock.

Besides the small crops* of hæmatite to the north of the main workings, referred to under the description of the Ore-bodies, the freehold includes a comparatively important crop at Pisa Hill, described elsewhere in this report.

There is a possibility of the strata between Mount Leviathan and Pisa Hill having been bent into a deep synclinal fold, and in that case the iron ore-bodies cropping on opposite sides may all occur in one stratum, though they will of course have no direct connection.

The association of hæmatite and sulphides is strong evidence in favour of the ore-bodies being genetically due to regional metamorphism, but there is some further evidence of extensive faulting at the Great Australia, allowing of the introduction of copper from deeper seated regions.

Ore deposits.—The main crop at the Great Australia consists of a great number of bunches of ferruginous ore, distributed through the country, but the bodies stoped may possibly be on lines of fault. In their present state an inspection cannot be made and my conclusions are therefore indefinite.

Mr. Jack first described lode B as on a line of fault, but it is not certain as to whether he also considered lode C to mark a fault. There is in fact a probability of the latter lying along the bedding of the country. Evidence of still another fault is available. This is an east and west crop 1 to 2 ft. thick, of silicified limonite, 2½ ch. north of the adit. It would thus appear that the main outcrop lies between two faults, and is intersected by a third. Further, the divergence in the general strike of the country east and west of the workings indicates that there is also a more extensive north and south fault to the east of the main crop. This is more likely than any of the others to have sharply bent near the southern end. In the northern opencut no ore richer than 10% in copper can now be seen, but there is of course a possibility of rich bunches raising the average much above this.

In my opinion it will be found that the ore occurs in big lens-shaped masses here, and that when one pinches out one or more others will be found on sinking, crosscutting or driving. The ore bodies here seem to occur at no great intervals, presumably owing to the major and minor faults referred to under "Geology." At the present time it cannot be affirmed that the ore in sight is payable, but the probabilities warrant sinking to water-level at least, and then crosscutting and driving.

The approach to the adit exposes ferruginous altered slates, dipping westwards 70° and containing bunches of limonite, over a width of a chain.

The adit itself reveals two ore-bodies. The first, 12 to 15 ft., consists of gossan, with occasional bunches of copper ore; then across the drive to the south there is 15 ft. cupriferous and gossany altered quartz-bearing country rock, beyond which to the face is found dense limonite, with thin seams of malachite. There is no sign of fissuring, but even if there had been fissures one would not expect to find much evidence in such softened country as this. There can be no doubt that this gossan will be found to pass down into low-grade pyrite—containing perhaps 5% copper.

The approach shaft was sunk in copper-stained limonite; and there are about 60 tons of that ore stacked adjacent to it, but part of this may have come from the adit.

The tunnel shaft, at 56 ft. depth, passed out of a body of dense limonite in decomposed greenish country, with irregular bunches of cuprite-limonite ore up to a foot in diameter. The western crosscut proves the limonite body to be at least 12 ft. wide, and to have scattered through it grains and lumps of quartz, and besides to be slightly stained by malachite. The ore at the 50-ft. level is undoubtedly poor, but there is every probability of richer being found at water-level, below which sulphides may be expected in quantity. Only about 5 cwt. of ore, limonite rich in cuprite and malachite, had been paddocked.

The Central Ore-body.—Mr. Jack's lode B runs off north-east nearly at right angles to the main crop at the bend, and can be traced for 3 ch., chiefly as stains in the country. At a distance of a chain from the main crop it projects 10 ft. above the ground, and for over ½ ch. has a width of 5 ft. It is composed of silicified gossan, only slightly copper-stained. Mr. Jack states that lode B occurs on a line of fault, but I had no opportunity of verifying that observation.

The Southern Ore-body.—Mr. Jack's lode C, which is south of the main crop and converges, as indicated by the main open cut, towards lode B, may be either on a line of faulting or else on a bedding plane.

The main engine shaft is being sunk in the foot-wall (the eastern side) of an ore body, but some bunches of limonite containing cuprite have been obtained in cutting down the shaft. (Later, see "History.")

Eastern Ore-bodies.—Copper-stained country is found about a chain east of the southern workings, and on the flats to the north and north-east of the main crop numerous bodies of hæmatite outcrop as well as cherty yellow siliceous rock, quartz and slightly cupriferous gossan following the general strike of the western country. A gossan crop of some promise lies abut 5 ch. distant from the northern end of the main crop.

Conclusions.—From the descriptions given above, it will be seen that in the present state of the workings it is not possible to calculate even the probable amount of ore available here, and no estimate can be made of the average tenor of the ore. Nevertheless, it can be stated that the deposits are worthy of thorough trial, and the developments only now being undertaken with the idea of blocking out the deposits are in every way warranted.

No. 11 (M.F. 11).

LOCATION, ETC.

Freehold No. 11 adjoins the township on the east and the A1 freehold on the north.

Its area is 80 ac. It is the property of the Queensland Exploration Company.

No outcrops can be seen here, owing to the covering of alluvium.

No. 13 (M.F. 13).

LOCATION, ETC.

Freehold No. 13 touches M.F. 19 on the north-western corner and lies just north of the township of Cloncurry.

Its area is 80 ac. It is held by the Queensland Exploration Company.

ORE-BODIES.

No outcrop was seen on this holding, though the Company's plan indicates a small " outcrop" near the northern boundary.

No. 14 (M.F. 14).

LOCATION, ETC.

Freehold No. 14 lies 1½ mile north-north-east of the township.

Its area is 80 ac. The Queensland Exploration Company now holds this ground.

LITERATURE.

For title of report, numbered as below, see Introduction.

(7) Mr. Rutherford speaks thus of freehold No. 14:

> Like the Wanderer's, it consists of low disconnected ridges of indurated sandstone, which can be followed for a distance of 300 yards in a north-east and south-west direction. The country in the neighbourhood consists of similar low ridges of metamorphosed sandstone lying on the schist, but the presence of iron and silica in the "outcrop" seems to have determined the deposition of copper along this line. I examined nine trenches along the ridge, which all showed the rock stained in places with green carbonate. Two shafts, one 30 ft. deep and the other 16 ft. deep, show nothing beyond what is seen in the trenches. No body of ore can be seen on the property, though rich nodules of red oxide can be broken off here and there from the outcrop. A heap at grass near the 30 ft. shaft might, if picked, yield 1 ton of good ore. This little bunch of ore occurring at the surface probably determined the position of the shaft.

DEVELOPMENT.

The workings, which are in the south-western part of the freehold, comprise a shaft 35 ft. deep, three trenches at 1½ ch., 3½ ch., and 5 ch. to the south-west, and a pothole 10 ft. deep, 1½ ch. beyond. During the second half of the year 1907, four shallow shafts have been sunk by the Company.

ORE-BODIES.

The workings are on a more or less cupriferous and ferruginous quartzose crop, striking generally north-east and south-west, between crushed quartzites and schists to the south-east and ferruginous quartzites and schists to the north-west. Towards the south-west the crop—nearly 20 ft. across—is very siliceous, and is poor in copper, but, iron oxide being abundant, an improvement may take place in depth. "Floaters" of native copper and cuprite have been found in the soil over a width of 50 ft. on the trenched part of the ground, but no defined body of ore has been located.

The north-eastern trench is in dense limonite with copper stains and impregnations of secondary sulphide, warranting further work here.

The main shaft was sunk on a band of silicified limonite in clayey gossan. All firsts have been removed, but there are at grass about 2 tons of seconds—siliceous limonite with stains of malachite and thin veins of cuprite—containing not more than 5% copper.

The manager has reported the results of the work done on this freehold during 1907 to be very disappointing, and prospecting was therefore abandoned in September.

Cave Canem (M.L. 456).

LOCATION, ETC.

The Cave Canem adjoins M.F. 14 on the east, its distance north-east from the township being 1½ mile.

Its area is 9⅓ ac. Under exemption when visited.

Only two shallow trenches have been opened on this property, one half-way along the north-western boundary and the other 5 ch. south of the north-western corner.

ORE-BODIES.

No ore-body has yet been exposed, practically the whole of the base being covered by alluvium. At the northern trench silicified gossan floaters were found from the surface to bedrock 5 ft. below. This siliceous rock is similar to that found in the vicinity of the Great Australia and other lodes in the district, and may generally be considered as replaced limestone.

In the southern trench can be seen a clayey gossan, with occasional splashes of copper ore as well as the siliceous rock. Further trenching is therefore warranted here.

This lease would seem, from the evidence available on the Ma Foi, to be on a calcareous zone, where precipitation of copper ores is likely to have taken place.

Ma Foi (M.L. 508).

LOCATION, ETC.

The Ma Foi adjoins the Cave Canem on the north-east.

Its area is 5 ac. Under exemption when visited.

There is one shallow pit on the western boundary, and a trench near the centre of the lease.

ORE-BODIES.

No ore-bodies have yet been found here, but the geology is interesting.

A belt, 1 ch. wide, of fairly pure crystalline limestone, with traces of copper, runs for 5 ch. north-north-eastwards along the north-western boundary of the lease, and is overlapped by a second thinner bed, 7 ch. long, reaching within 1 ch. of the northern corner peg. To the east of the limestones, ferruginous quartzites have been trenched and shown to be in parts gossany and stained by malachite and azurite, while vugs are lined with quartz crystals, coated with black oxide.

There is no sign of any quantity of even low-grade ore here, though the conditions are not unfavourable for deposition.

No. 4 (M.F. 4).

LOCATION, ETC.

Freehold No. 4 lies 2 miles east-north-east of the township.

Its area is 80 ac. It is held by the Queensland Exploration Company.

No ore-bodies have been found on this freehold.

No. 3 (M.F. 3).

LOCATION, ETC.

Freehold No. 3 is 2½ miles east-south-east of the township.

Its area is 80 ac. The Queensland Exploration Company now holds the freehold.

An unsuccessful search was made for the old workings here, which comprise, it is believed, two shafts.

ORE-BODIES.

The only ore seen was hæmatite and a little dense limonite. The main crop, which runs north and south along the summit of a ridge, is several chains long, and in one place is probably 40 ft. wide. No copper ore was seen, but other iron-bearing crops are visible on a line to the east of the northern end of the main crop.

It is unlikely that any considerable body of copper ore is to be found here.

Lady Mina (M.L. 552).

Mgr., Miller.

LOCATION, ETC.

The Lady Mina is 30 ch. south-east of M.F. 3 and 3 miles east of the township.

Its area is 5 ac. This is understood to be the property of the firm of Graham and Matheson.

DEVELOPMENT.

The workings comprise a shaft 56 ft. deep (Jan., 1907), and an opencut running 35 ft. to the north-west from the shaft, which is in the southern corner of the lease.

OUTPUT.

1906 ... 3 tons.

ORE-BODIES.

In the opencut can be seen a well defined footwall, dipping about 75° to the north-east, but all ore has been removed. The ore can be

No. 2 (M.F. 2).

Location, Etc.

Freehold No. 2 adjoins the A1 freehold at the south-western corner, and is traversed by the main anabranch of the Cloncurry River.

Its area is 160 ac.

It is held by the Queensland Exploration Company.

Ore-bodies.

The ground has been secured presumably to catch the continuation of the Contra lode of the A1 freehold, but, being covered by sandy alluvium, no outcrops have been found.

No. 19 (M.F. 19).

Location, Etc.

The second Freehold No. 19 is located on the anabranch of the Cloncurry River at the south-western corner of the township.

Its area is 19 ac.

Ore-bodies.

The holding, which was not inspected, is on the flood plan of the Cloncurry, and no outcrops were expected, but the company's plan shows a short one running north-north-eastwards. The manager reported in July, 1907, that this crop had been exposed over a distance of 262 ft., and proved to be about 6 in. wide; later he sank a shaft 16 ft., the vein, consisting of "bornite and chalcopyrite, in a specular iron matrix," being about 5 in. wide in a formation 2 ft. wide.

No. 10 (M.F. 10).

Location, Etc.

Freehold No. 10 is situated at the junction of Chinaman Creek with the Cloncurry River, and is 1½ mile west-south-west of the township.

Its area is 125 ac. The freehold is now the property of the Queensland Exploration Company.

Ore-bodies.

The freehold lies to the east of the main mass of Mount Leviathan, but includes the north-eastern extremity of the iron ore deposit.

The company's plans indicate a small east and west "outcrop of peacock copper" on the eastern side, which, however, was not seen by me. This crop has been sunk on since my visit. At a depth of 25 ft., "the ore-body has opened out to about 3 ft. . . . with 5 in. of good ore on one side and 8 in. on the other. This would average about 20 per cent. copper." In September, at 34 ft. depth, the formation occupied the whole width of the shaft, there being 6 in. of good ore on each side. At about 40 ft. depth much water was struck. The shaft at 37 ft. below the surface shows 2 ft. of 20% ore at the northern end, and 8 in. at the southern. Drives were carried northwards on 6 to 18 in. good ore in a 4-ft. formation and southwards in poor formation.

MORRIS CREEK.

The ore-bodies here examined trend generally east and west, as at Duck Creek, in contradistinction to those of the rest of the field, which run north and south. The crushing of the country, however, has been far less intense than at Duck Creek.

SERPENT HILL GROUP.

This group comprises the five contiguous freeholds—Nos. 5, 6, 7, 8, and 9—lying 6 miles west-south-west of Cloncurry.

The holdings were deserted at the time of my visit, and, there being some doubt as to their exact location, no attempt was made by me to find them. They have since been re-marked, and have now passed into the hands of the Queensland Exploration Company.

The freeholds are each 160 ac. in extent, and they lie on a north-west and south-east line, being in contact only at opposite corners.

Nos. 5, 6, and 8 are reported to include no outcrops. Mr. Rutherford remarks, "It is difficult to understand why such a large area—800 acres—was taken up in this district. . . . as I failed to see any indications that payable ore would be found on these freeholds."

Serpent Hill No. 7 (M.F. 7).

LOCATION, ETC.

No. 7 is at the south-eastern extremity of the group, and lies 4½ miles south-west of Cloncurry.

Its area is 160 ac.

LITERATURE.

For title of report, numbered as below, see Introduction.

Chum (M.C. 329).

Mgr., Davis.

LOCATION, ETC.

The Chum is 7 miles west-north-west from Mount Leviathan and 2 miles east from Butcher's Creek. There has been some doubt as to whether this lease is located on a freehold.

Its area is 600 ft. × 350 ft. It was exempt when visited.

DEVELOPMENT.

The workings comprise only one shaft, 15 ft. deep (10 ft. long and 6 ft. wide), and two potholes, 5 and 4 ft. deep respectively, 10 and 20 ft. east of the shaft. No work has been done here for some time.

OUTPUT.

1906 ... 3½ tons of ore shipped.

ORE-BODY.

The country here is stratified quartzite, and little can be made out as to the strike of the deposits. In the shaft the body appears to strike north-north-east dipping easterly, but the potholes are on an east-by-south line, and in the first cupriferous gossan is exposed, while in the second gossan can also be seen. A small patch of oxides crops 1½ ch. west of the shaft. These, however, appear to be separate patches, and a chain to the east only iron-stained quartzites, similar to the country to the south, can be seen. The quartzites crop within 30 ft. south of the shaft, and the lode can therefore have no extent in this direction, while it is likely to prove bunchy in form.

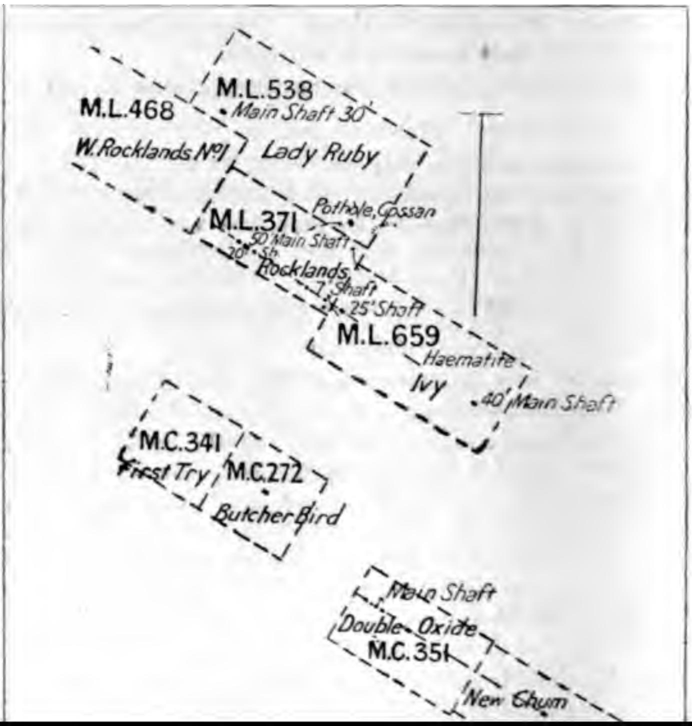
Over the whole length of the shaft masses of gossan and bunches of chalcocite-limonite ore, both with malachite and the former with some cuprite, occur between horses of country rock. Barren rock, cupriferous and ferruginous clay, and ore (varying between 10% and 40%, but averaging 20% copper) may be taken as present in equal quantities—the northern side of the shaft being rather poorer in copper, though richer in iron, than the southern. The western end of the shaft shows a face—perhaps a wall of the lode—dipping 10 in 1 to the east.

About 3 tons of lump ore, as raised from the shaft and lying at the brace, consists of siliceous limonite with tile ore and malachite, and may run 20% copper. The appearance of this ore is promising for the finding of richer ore beneath. The 1½ ton of firsts near the shaft comprise siliceous limonite, tile ore, crystalline cuprite in banded aggregates, acicular malachite, and dense chalcocite, and should contain at least 20% copper—the percentage depending chiefly on the composition of the tile ore. Besides this there are 6 tons bagged on the ground.

Thus, no continuous body of ore has been proved here, but the outcrops should receive thorough prospecting.

ROCKLANDS GROUP.

This group lies between Butcher's and Morris Creeks, 9 miles west of Cloncurry. Little work was going on here at the end of last year.



OUTPUT.

1904	... 8 tons	(Magpie)
1906	... 12½ ,,	(Oxide)
—	... 8 ,,	(Roberts and party)
Total	... 28½ ,,	

ORE-BODIES.

The New Chum line, which appears to be parallel to and about 10 ft. south of the Oxide, can be traced along the surface by crops of quartz and gossan.

Very little ore can have been raised from the eastern shaft, which is on the above line.

The Oxide, striking east 20° south, makes little show at the surface, but at the main shaft a formation—altered schist—rich in copper in parts but averaging only 10% in the present face, has been exposed over a width of 4 ft., and no hanging-wall has yet been reached. The formation pinches to 2 ft. 6 in. in the eastern end of the stope, and the average content there is 15% copper. Flat clay floors, some of them 6 in. thick, cross the formation at intervals of from 6 in. to 2 ft. Malachite is the chief copper mineral in the limonite, but chrysocolla is more abundant in the altered schist. The firsts at grass, amounting to 5 tons, are rather siliceous limonite with veins and bunches of cuprite; and some 16 tons have been shipped from here. The mullock tip should carry at least 5% copper.

The country rock at the second shaft is a quartz-veined argillaceous quartzite, but the ore here carries little quartz. The 10 tons of ore at the brace have not yet been sorted. It is chiefly limonite containing malachite, chrysocolla, and cuprite, and carrying about 10% copper.

New Chum (M.L. 634).

Mgr., Davis.

LOCATION, ETC.

The New Chum adjoins the Double Oxide on the east.

Its area is 5 ac.

The only excavations beyond a few shallow trenches is the shaft, 20 ft. deep, near the centre of the claim.

ORE-BODY.

The ore-body can be traced westwards to the eastern shaft in the adjoining claim, the line being parallel to, but about 10 ft. south of, the main Double Oxide line.

The shaft was sunk in thin bedded slates, with bunches of silicified limonite; and there is at grass about 1 cwt of quartz-bearing limonite, containing a fair proportion of cuprite. The cuprite is crystalline, and in most unsymmetrical forms, but is evenly, if thinly, coated with vitreous greenish chrysocolla. This ore has some resemblance to that at the Great Australia.

Butcher Bird (M.C. 272).

Mgr., Roberts.

Location, Etc.

The Butcher Bird shaft lies about 10 ch. west 35° north of the Double Oxide.

Its area is 600 × 350 ft.

One shaft, 14 ft. deep, and a pothole, 7 ft. deep, are all the workings.

Output.

1905 ... 8 tons.

Ore-body.

The shaft has been sunk in rotten formation—ferruginous kaolin with lumps of limonite, showing some malachite towards the bottom. Nothing definite has yet been proved here, but sinking should be continued.

This does not seem to be a continuation of the Double Oxide as its strike (east-south-east) would carry it to the north of the main workings on the latter.

The pothole to the north-west of the shaft is in iron-stained quartz not worth further testing.

First Try (Extended M.C. 341).

Mgr., Melhouse.

Location, Etc.

The First Try adjoins the Butcher Bird on the west.

Its area is 400 × 350 ft.

Only four potholes have been opened here, the deepest 4 ft. down. No lode has yet been found.

Rocklands (M.L. 371).

Mgr., Hockings.

LOCATION, ETC.

The Rocklands is less than ½ mile south-east of Morris Creek, and 9½ miles west-by-north from Cloncurry, the distance by road being 10 miles.

Its area is 5 ac. The lease was exempt when inspected at the end of 1906, and the mine had been idle for some time.

DEVELOPMENT.

The workings run nearly the whole length of the lease, but are all shallow. The eastern shaft (*a*), 10 ft. deep, is ½ ch. from the south-eastern corner; 5 ft. west of it is a trench, 10 ft. long; 1 ch. beyond is a shaft (*b*), 7 ft. deep. Then 4 ch. further west is a shaft (*c*), 20 ft. deep (flooded); ½ ch. beyond is another (*d*), 15 ft. deep (filled in), at which some stoping has been done; and 10 ft. further west is the main shaft (*e*), 50 ft. deep (inaccessible). A filled-in trench lies 10 ft. west of the main shaft, and 15 ft. beyond it is another shaft (*f*) 15 ft. deep.

OUTPUT.

1906 ... 22½ tons.

ORE-BODIES.

The line of strike is west 32° north, and the dip is 5 in 1 northwards, as shown by the workings. The country rock is a black slate weathering to a brown tint and bleached almost white near the ore-body, especially in the western shafts. Very little can be seen of the ore-body, which, however, can nowhere have exceeded 2 ft. in thickness. Practically all rich ore raised has been shipped, and it cannot be said, without further development, that there is any in sight.

A few hundredweights of very siliceous fine-grained carbonate ore (25% copper) is at grass at shaft (*a*); and at shaft (*b*) there are a few pounds of carbonate and oxide ore. Only a small heap of seconds—country carrying 1% copper—now remains at shaft (*c*).

At the main shaft (*e*) there are now only 2 cwt. of firsts (30% copper) at grass—chalcocite with malachite stains and coated with kaolin. The cellular gossany seconds at grass amount to 10 tons, and should average 5%.

In the western shaft (*f*) the formation near the surface is 1 ft. wide, and a bunch of rich ore was gouged out here.

Rocklands No. 1 East (M.L. 659).

Mgr., Lyons.

LOCATION, ETC.

This, which is also known as the Ivy, adjoins Rocklands on the east.

Its area is 8 ac. Exempt when inspected.

DEVELOPMENT.

The main shaft at the eastern end of the lease is 40 ft. deep; and water is now standing at about 35 ft. below the surface. A stope runs back 10 ft. on the northern side of the shaft.

Another shaft, 25 ft. deep, and a cutting are on the north-western boundary.

OUTPUT.

	18	tons	(western workings)
	3	,,	
	3	,,	rubbly surface 28½%
	7	,,	no returns to hand
Total ...	31	,,	

ORE-BODIES.

The western shaft and cutting are on the Rocklands line. The country is softened slate, and the ore, striking east 35° south, crops as silicified limonite, with malachite and tile ore. One bunch here yielded 18 tons of pay ore.

Some dense hæmatite indicative of regional metamorphism crops on the line of strike between these workings and the main shaft.

In the main shaft a formation, 3 ft. wide, of malachite-stained softened slate with siliceous cellular gossan, dipping steeply northwards, has been struck. The gossan is a promising feature, as far as improvement in depth is concerned. The hanging-wall country is much slickensided internally owing to lateral crushing, as proved by the horizontal striæ. The ore at grass, 4 tons, is chiefly earthy carbonate with traces of glance and rather much quartz, but is expected to yield 30% copper.

Ore-bodies.

The southern pothole is on gossan, but has not yet struck ore.

The main shaft is sunk just to the south of a quartzite crop in decomposed slates dipping northwards about 4 in 1.

The only ore at the shaft is about 1 cwt. of copper-stained country rock, in which can be seen small seams and beads of cuprite.

Nothing is visible here to warrant further work.

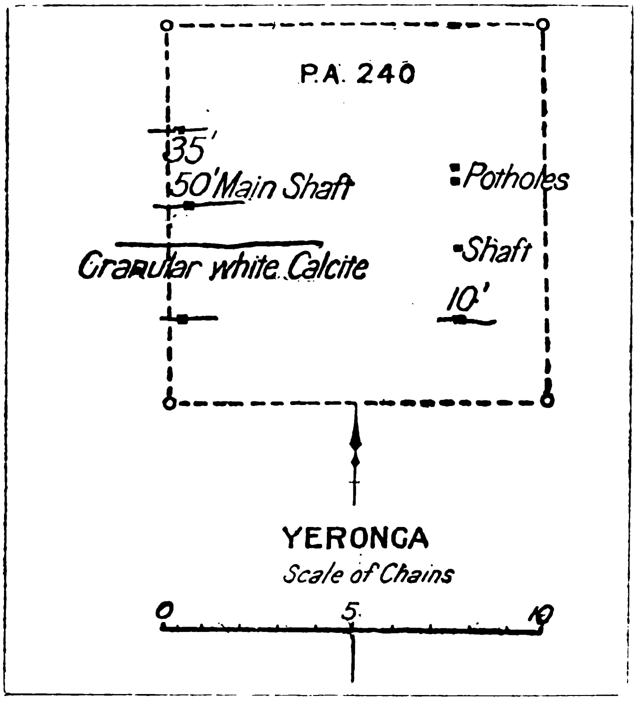
Yeronga (P.A. 240).

Mgr., Hockings.

Location, Etc.

The Yeronga is ¾ mile north-west of the Rocklands, ¼ mile over Morris Creek.

Its area is 10 ac.



Development.

The main shaft, 50 ft. deep, with 8 ft. standing water, is near the middle of the western boundary, has a stope running back for 10 ft to the east, and drives 12 ft. east and west at the bottom and 20 ft. depth respectively; a second shaft, 35 ft. deep, lies 2 ch. to the north (inaccessible); a third lies 7 ch. to the east; and a fourth, 10 ft. deep, 7 ch. to the east-south-east.

OUTPUT.

Total of 30 tons shipped averaging 34% copper.
5 ,, 27% ,,
—
35 ,,

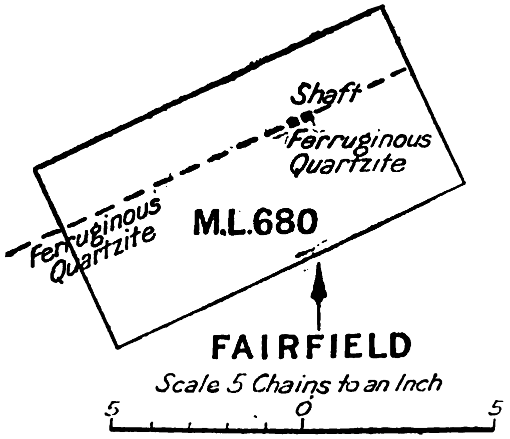
ORE-BODIES.

There are here at least three east and west striking lines, besides which, a chain south of the main shaft, is a defined crop of granular white calcite. Earthy calcareous sinter, derived from the country rock, is also very abundant in all the ore raised here. The occurrence in the main shaft is promising, but no quantity of ore has yet been proved.

The ore-body, in which is the main shaft, dips 10 in 1 to the south. It is 1 ft. wide at the surface, but, in the western drive, there is quite 2 ft. of limonite and very calcareous ore. The country there is softened slate, without sign of movement. The ore at grass, about 1 ton, is limonite with much chalcopyrite, considerable malachite, and some chrysocolla.

The south-eastern shaft is in decomposed calcareous slate, in which a little ore has been got. Fragments of ore can also be got along the line of strike, and about 7 ch. to the west was found a patch which yielded 3 tons of 33% ore—chalcopyrite and chalcocite.

The northern shaft is in very limy decomposed country, in which the ore occurs as boulders near the surface, but at the bottom there is a defined formation 3 ft. wide. The seconds, about 1 ton, are limonite with chalcopyrite, pyrite, chrysocolla, and carbonates. Some [redacted] and underlying 10 in 1 to the south, lies 30 ft. to the west; and the new shaft, 15 ft. deep, is 30 ft. south-west of this.



Output.

2 tons shipped 32% copper.
3 ,,

Ore-bodies.

The Fairfield crop at the new shaft is 10 ft. wide, and consists of silicified limonite and gossan. It pinches out about 20 ft. west of the shaft, but crops again in several places beyond. Eastwards also it thins out, but there is here a band of gossan on the northern side, in which the old shafts were sunk. The crop strikes east-north-east, and the dip is to the south-south-east.

The two old shafts appear to be on one shoot, of which the silicified limonite forms the hanging-wall. In the shaft (*b*) a formation, 1 to 2 ft. wide, carrying bunches of ore, is exposed.

The new shaft is being sunk in kaolinised slate above the silicified limonite. A nearly vertical lens of ore was met in this shaft, and there is now paddocked about 2 tons of siliceous chalcocite-malachite ore expected to yield 30% copper.

Nothing of any value has yet been exposed here, but there is a possibility of the silicified limonite blows overlying sulphides, and the amount of silica may decrease with depth.

Unnamed (M.F. 16).

Location, Etc.

This freehold is south of Morris Creek, 9 miles west-south-west of Cloncurry.

Its area is 160 ac. Not inspected.

CAMERON RIVER.

The Cameron River mines are of relatively little importance. The Federal is included here, as is the usual custom, though it is really within the Corella drainage area. Numbers of claims have been, or are, in existence on the northern side of the Cameron Valley, but their location had not been sufficiently fixed for a visit to be paid to them.

MOUNT LLOYD GROUP.

The Mount Lloyd Group is located in the valley of the Cameron River. It comprises, besides those described below, the Mount Lloyd No. 1 North (M.L. 497), Mount Lloyd No. 2 South (M.L. 517), and Mount Lloyd No. 3 South (M.L. 545), on which no work has been done, and the Saint Patrick (M.L. 498), in the southern part of which is a shaft, not seen by me.

Mount Lloyd (M.L. 446).

Mgr., Thompson.

LOCATION, ETC.

Mount Lloyd lies 31 miles west of Cloncurry and about 2 miles south-east of the West Leichhardt telegraph line.

The leases are on a north-north-west running razor-back near the centre of a wide flat-bottomed valley, bounded by a rounded range to the west and a fairly-level topped range to the east.

Its area is 30 ac. It is understood to have now been abandoned, the exploratory work having been carried out under option by the North Queensland Exploration Company.

DEVELOPMENT.

An opencut 25 ft. long, 10 ft. wide, and 7 ft. deep, has been

EUSTON GROUP.

This group is on the lower portion of the Cameron River, near the bottom crossing of the West Leichhardt telegraph line.

Cameronian (M.C. 196).

Mgr., St. Onge.

LOCATION, ETC.

The Cameronian lies 27 miles west-north-west of Cloncurry, and about a mile north-west of the West Leichhardt telegraph line.

Its area is 400 ft. by 350 ft.

One hole has been sunk 7 ft.

OUTPUT.

Several tons of ore are reported to have been shipped.

ORE-BODIES.

Bunches of cupriferous gossan are found to occur in slates over a width of 30 ft., at the southern end of a low ridge. The hole is on a copper-bearing lenticular body 2 ft. to 2 ft. 6 in. wide, which can be traced for about a chain to the north-east. There are at grass a few hundredweights of seconds, consisting of quartz-bearing limonite, with some chalcopyrite, chrysocolla, and malachite.

Unnamed (M.C.).

Mgr., Lidster.

LOCATION, ETC.

This is about ¾ mile north of the Cameronian.

A pothole, just begun, was 4 ft. deep when visited.

ORE-BODIES.

The pothole is in earthy limestone and sintry slates containing bunches of limonite-malachite-chalcopyrite ore. About 1 ton of ore is paddocked, and consists in great part of limonite, with original chalcopyrite and stains and coatings of malachite. It is likely to yield 20% copper.

FEDERAL GROUP.

The group comprises only one lease.

Federal (R.C. 52).

Mgr., Brassington.

LOCATION, ETC.

The Federal lies 20 miles west-north-west of Cloncurry. The Argylla road passes the mine, about 3 miles west of the Corella River.

The country here is open and rolling with gravelly red soil, timbered sparsely with mountain gum and clothed with spinifex.

Its area is 80 ac. The mine was deserted when visited by me, but has since been taken over by the Federal Reward Copper Company, Limited.

DEVELOPMENT.

The main workings appeared to have been deserted for some time, and most of them have collapsed. They comprise, beginning at the southern end: an open cut (*a*), 35 ft. long and 15 ft. wide, now full of water: a trench (*b*), 10 ft. long, 10 ft. to the north of the cut; two potholes (*c* and *d*), 5 ft. deep and 15 ft. apart, 35 and 50 ft. north of the last: a filled-in cut (*e*), 10 ft. long, 20 ft. beyond; a flooded trench (*f*), 10 ft. long, with a 10-ft. hole at one end, 5 ft. to the north; and a main shaft (*g*), 30 ft. deep, with open cuts or fallen-in stopes for 15 ft. north and 10 ft. south at 15 ft. beyond the last. At 5 ch. north-north-east of the main shaft is the shaft (*h*) last worked, which is about 15 ft. deep: and about 1½ ch. to the south-east of it are a few shallow trenches.

OUTPUT.

1904	... 85 tons shipped.
1905	... 71 ,, ,,
1906	... 12 ,, ,,
	... 12 ,, ,, *
Total	... 180 ,, ,,

ORE-BODIES.

The southernmost cut (*a*), being full of water, reveals little. There are about 5 tons of seconds alongside it—siliceous ore containing malachite and nodular radiating azurite, and likely to run over 15% copper. The whole of the mullock tip should yield at least 1%

at grass amount to 4 tons; they are very siliceous, but are gossany and carry perhaps 5% copper chiefly as carbonate. Further there are about 4 tons of unpicked ore paddocked, consisting of limonite with disseminated malachite and bunches of azurite, which must have come from bodies up to 12 in. in width.

The country rock is kaolinised schistose slate passing near the lode into greenish chloritic schist, in which the ore-bodies occur on a general north and south line, dipping about 5 in 1 to the west.

The new shaft (*h*) is on a 2-ft. band of country (slaty schist with north and south strike), carrying malachite and azurite. The strike is north and south and the dip is steep to the west. There was 1 cwt. of firsts (limonite with traces of chalcopyrite and rich in malachite and azurite) of 30% copper grade; and a few hundredweights of 20% seconds, at grass.

The easternmost trenches prove only that the schistosity of the country here trends north-eastwards.

The workings have been too long idle for much to be learnt as to the nature of the ore-bodies, further than that they are composite lodes—with comparatively small linear extent. The indications warrant further opening up to test whether an improvement takes place in depth.

ARGYLLA CREEK.

The Princess East, South, and North are three leases (Nos. 594, 593 and 592), each 10 ac. in area, of which no particulars are to hand, beyond that they lie 3½ miles south-east of the Argylla freehold. The Megaphone, a lease (No. 541) of 10 ac. is understood to lie 3 miles south of the freehold.

ARGYLLA GROUP.

The group comprises a freehold and a few leases in its vicinity. The Argylla North (M.L. 539), West (M.L. 536), and South (M.L. 540), after being abandoned, were taken up again by the West Cloncurry Copper Company, Limited, in areas of 20 ac. adjoining the freehold.

Argylla (M.F. 3073).

Location, Etc.

The freehold is situated on the eastern side of a branch of the Argylla valley, 13 miles east of the West Leichhardt Telegraph Station and 40 miles west of Cloncurry.

Its area is 40 ac. The Argylla is now held by the Queensland Copper Freeholds, Limited. My visit was made with the assistance of and in company with, the Warden (Mr. Linedale), on whose account the examination had to be very hurriedly performed. From what was seen, however, it was not considered worth while to revisit the locality even if it had been possible without considerable expense, more especially as the ground was deserted.

Literature.

(2) Mr. Jack's report is as follows:

An average sample of the portion of the lode exposed gave 15·95 per cent. copper, a trace of gold, and 2 dwt. 22 gr. of silver per ton from the northern cutting, and 35·2 per cent. of copper, a trace of gold, and 9 dwt. 2 gr. of silver per ton from the southern cutting. An irregular trench on the summit of the outcrop, some 70 ft. east-north-east of the southern cutting, is about 6 ft. deep and 6 ft. across, and goes east for 20 ft., and then north for about 18 ft. It exposes decomposed talcose and sandy schists with scattered veins of quartz and carbonate ores running through it. About 10 or 12 tons of picked ore are lying in the trench. An average sample taken from this picked ore gave a return of 20·75 per cent. of copper, a trace of gold, and 4 oz. 2 dwt. 8 gr. of silver per ton. To all appearances the Argylla Outcrop should be able to furnish a considerable quantity of ore of a value quite equal to that found in the trench on the summit, and the cuttings into the walls. The working of the lode would no doubt mean the removal of a great quantity of valueless material, but the ore would be easily picked from the gangue, and according to the assays of a very good percentage. The extent and value of the copper-bearing belt could be comparatively easily proved by surface trenching along the line of strike of the lode.

(7) Mr. Rutherford's description is as below:

This includes a succession of parallel beds of altered sandstone lying on schist forming a range running north-west and south-east for 2,000 ft. and rising to a height of 80 ft. above the general level. The rock is coloured a bright green in places with copper carbonate. This staining is very patchy, and is most pronounced in joints and in natural caves in the rock. In places small seams of red oxide and glance are seen. . . .

Following the outcrop to the north it ends in barren, tough quartzite, and at its southern extremity it ends abruptly, and does not outcrop anywhere down the side of a steep schist hill.

This belt of country, which is similar to many others seen in the district, contains a few seams of rich glance and red oxide scattered in a detached irregular manner through the formation. Due to the enormous amount of dead work which would have to be done to mine any of this ore, I consider that it would be an unprofitable undertaking.

(1) Mr. Linedale in a report dated 31st October, 1907, states:[1]

A few days ago I paid a flying visit to the Argylla Freehold. The West Cloncurry Copper Company, Limited, has closed down all its mines in this locality, but the Freehold is still being prospected. In the latter property, No. 1 shaft is down a depth of 100 ft., and crosscuts at that level have been extended north-east and south-west. The south-west cut has penetrated a distance of 100 ft., the first 30 ft. being through a formation carrying bunches of quartz and nodules of limonite and oxidised copper ores. The north-east cut is in 130 ft., the first 40 ft. of which pass through a formation carrying a little copper, and from thence to within a few feet of the face a body of schist, slightly impregnated with copper, was passed through. The face of the cut is now in a formation of crushed quartz, showing stains of copper carbonates. No. 2 shaft was sunk to a depth of 100 ft., and crosscuts extended north-easterly and south-westerly 40 ft. and 100 ft. respectively. The former cut passes through bars of diorite and quartzite carrying a little copper sulphides, and the latter for some distance is through a formation of quartzite and limonite impregnated with carbonate of copper. The end of this cut is in micaceous schist.

DEVELOPMENT.

Four cuts have been opened on this property. The northernmost (not seen by me) is stated to be 30 ft. long. At 7 ch. to the south is a costean 25 ft. long and 6 ft. deep. The third cut, 1 ch. to the north-east of and 30 ft. above the last mentioned, is 7 ft. deep and runs 15 ft. south-west and then 15 ft. west. The fourth cut (not seen by me) is said to be 9 ft. long and to be just above the third.

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[1] Q.G.M.J. Nov. 1907.

ORE-BODIES.

Only two ore-bodies were seen by me. That at the southern trench comprises kaolinised slates dipping about 80° to the west-south-west and impregnated and replaced to varying extents, over a width of 4 to 5 ft., by cuprite, round which mineral the kaolin is considerably stained by malachite. The crop, consisting of kaolinised slate variously veined and impregnated with malachite, is traceable for 40 ft. to the south-south-west of the trench. This may be expected to yield some rich ore.

The main ore-body, at the upper trenches is U-shaped, the U being 1½ ch. in length and 40 ft. across, with the open end towards the south-east. The south-western arm consists of crushed carbonate veined quartzite, 6 ft. wide and passing into "silicified limonite" and then into quartzite towards the end. This is low-grade at the best. The northern arm is 15 ft. in width in one place but the trench exposes only kaolinised slates with bunches of mixed tile ore and malachite bearing ore. The cut would seem to indicate that concentration of carbonates has taken place near the surface owing to kaolinisation of the rock there, and the prospects of meeting a large ore-body by sinking are therefore not very bright. Some tons of a very siliceous ore, rich in crystalline malachite, are stacked here.

The crest of the Argylla ridge is of a siliceous rock—presumably silicified slate—but, Mr. Conder's sections, to which reference has

PALM-TREE.

A number of ore-bodies, among which may be mentioned the Cleanskin and Little King, have been worked at various times in the ranges at the head of Palm-tree Creek. The miners, however, have no confidence in their permanence, and, even in the vicinity of the Native Companion, several have not considered it worth while to register their claims.

In addition to those mentioned below, the plan accompanying Mr. Cameron's report shows a lease called Mount Bracewell, adjoining the Enfield on the north, and another called the South Mullen, lying 1½ mile to the north-west. No important ore-bodies were found on them, and they have now been abandoned.

NATIVE COMPANION GROUP.

Small crops of copper ore in schist are numerous in the vicinity of the Native Companion, and for at least 2 miles to the north, but except on the reward claim very little work has been done. The shoots at the surface are very short, but may possibly prove more extensive at a depth.

Native Companion (R.C. 19).

Location, Etc.

The Native Companion is located on the north-western side of Palm-tree Creek, 7 miles south-south-west of Quamby, on the Camooweal road, and 26½ miles north-west of Cloncurry.

Its area is 160 ac. The property is held by the Leichhardt-Cloncurry Company.

Development.

The main shaft, which is in the south-western corner of the lease, 10 ch. from the boundary peg, is 34 ft. deep, and has drives running 12 ft. to the south-west and several feet to the north-east at the 25-ft. level, which is just above water. Work ceased here because of a heavy influx of water, probably from the creek, which is 7 ch. distant. It is now proposed to install a pump. At 6 ch. to the north-east of the above there is an opencut and old shaft, caved in below a depth of 15 ft., but from which at the 30-ft. level a drive ran 50 ft. to the south-west. Another old shaft, 15 ft. deep, lies 1 ch. to the north-north-east of the last, and from this also there was a drive southwards.

The other workings comprise costeans at ½ ch., 2 ch. and 4 ch. north-east of the main shaft, a pothole alongside the Quamby track, near the northern boundary, and a costean on the bank of Palm-tree Creek, 4 ch. south-east of the last. One man was at work here on costean No. 3, at the end of the year 1906.

OUTPUT.

1904	33	tons shipped, carrying 49 to 52 % copper.
1905	$40\frac{15}{20}$	,,	,,
Total ...	$73\frac{15}{20}$	,,	,,

ORE-BODIES.

Two small shoots of payable ore have been located on a north-east and south-west line and, though small near the surface, further prospecting to test whether they increase in size at a depth is fully warranted.

Ore is stated to have been found at the surface on the site of the main shaft, though there is no trace of it to the south-west. In the shaft the ore-body had a width of 2 ft. 6 in. from wall to wall, but it pinched out in the drives, the face of the eastern showing only kaolinised micaceous schist country, with flat bunches of chalcopyrite, but no defined body. There is, however, a likelihood of further bodies being picked up, if the drive is continued. Nearly 50 tons of ore have been shipped from this shaft. The tip consists of crystallised quartz and kaolin with a little chrysocolla, and the whole of the material should carry 5% copper.

At the surface of the old shaft and cut can be seen 2 to 3 ft. of copper-stained clay-slate on end, and it is said that there is ore underfoot all along the bottom of the drive, where the formation is 2 ft. wide; and that 1 ton of 36% ore came from the drive. Some 29 tons of ore have been shipped from here. The seconds, of which there are 20 tons at grass, consist of kaolinised slate, stained on joints and carrying about 5% copper.

Unnamed (M.C. ?).

Mgr., Cummins.

Location, Etc.

This claim lies ¼ mile north of the Native Companion.

One trench, 5 ft. deep and 10 ft. long, has been opened here.

Ore-body.

There seems to have been a bunch here the length of the trench, striking north and south and dipping 70° to the east, in a bluish clay-slate. In the latter part of 1906, 4 tons of ore were shipped from the claim. The seconds, of which there is 1 ton at the trench, consist of siliceous limonite, with radiating spheres of malachite (sometimes coated by secondary silica) and with mammilated coatings of chrysocolla on the joints.

Good Luck (M.L. 353).

Mgr., Alman.

Location, Etc.

The Good Luck lies 3 miles north-west of the Native Companion.

Its area is 9⅘ ac.

No work has been done here beyond the sinking of a few potholes.

Literature.

For title of report, numbered as below, see Introduction.

(7) Mr. Rutherford says:

> On the surface loose boulders of jasper, lying on mica schist and stained with green carbonate, were seen.

Ore-body.

The outcrop is understood to be very siliceous, but somewhat ferruginous, and is shown on the survey plan as striking north-west and south-east.

Enfield (M.L. 61).

Location, Etc.

The Enfield is understood to be on Palm-tree Creek 7 miles south-south-east of the Lady Clayre.

The lease has now been abandoned.

Literature.

(4) Mr. Cameron wrote:

> South of Lease No. 61 are seen vertical north and south striking mica schists and fine felspathic sandstones. Four pits sunk on indications of copper expose soft white kaolinic material carrying rich glance associated with quartz. The quartz shows free gold in coarse grains. The kaolinic material is evidently derived from the decomposition of a felspathic rock, and the ore is evidently a concentration of copper along a more or less definite line. There is no sign of a

distinct lode. Trenches further south show a considerable amount of copper staining of the rocks, but a less amount of glance. Further north, on Lease No. 61, the rocks are considerably copper-stained, and blocks of glance ore can be knocked off from many of the outcrops. Similar occurrences of ore are found over most of the leases in this neighbourhood, but on none of them has anything of much value been found up to the present.

(7) Mr. Rutherford says:

> Starting at the northern end on the "Enfield," a contorted micaceous sandstone carries in places nodules of copper glance, and is freely stained with carbonate. Three tons of rich ore were collected from the surface by Mr. Henry and sent away. Going south, the sandstone is altered to a ferruginous quartzite, which does not show any stains. Continuing sixty yards to the south the sandstone shows again on the other side of a gully and shows stains in patches. A bed of calc-spar immediately to the west also shows carbonate stains. The copper in these leases occurs in a very patchy manner in sandstone, which is scattered loosely over the surface of mica schist. . . .

Oliver Twist (M.C. ?)

Mgr., Cummins.

LOCATION, ETC.

The Oliver Twist lies 6 miles south of the Native Companion.

There are stated to be two shafts, 12 ft. and 15 ft. deep respectively.

OUTPUT.

	15 tons,*	shipped by Cummins.
	14 "	" Bald.
Total	29 "	"

ORE-BODY.

The copper ore is reported to have had small vertical extent, presumably occurring in bunches in a vein of quartz 18 in. wide.

DUGALD RIVER.

The Dugald River groups, here dealt with, are all within 10 miles of where the Camooweal road crosses the river, 40 miles north-west of Cloncurry, though deposits have been, and others will in the future be, found southwards to the Cameron and Argylla. The ore deposits examined show more diversity of occurrence than is to be found over most of the rest of the field, and this is due to the neighbouring intrusive tongue of granite, which is continuous from here to within a few miles of the Cloncurry township. The connection between the copper ores and the granite is best exemplified at the Magnet and Mavis, more especially the latter, where copper is found with magnetite in a porphyritic rock, in juxtaposition to the granite.

Spotted schists are characteristic of the country in the vicinity of the Two Sports, but the rocks are in so decomposed a state that it cannot be determined whether the spots represent incipient secondary crystals in a sedimentary or kaolinised phenocrysts in porphyry.

UNA GROUP.

Only one mine was working here, but there is a likelihood of others being taken up in the neighbourhood, as indications of copper are abundant to the south.

No work to speak of had been done on the Una North Block, the Ivy, and the Una South, which are consequently not included here.

Una (M.L. 280).

Mgr., McGrath.

LOCATION, ETC.

The Una lies 1 mile east of the Dugald River, 8 miles west of Quamby, on the Camooweal road, and 33½ miles north-west of Cloncurry.

Its area is 9 ac. The Leichhardt-Cloncurry Company had just taken the property over at the time of my visit.

DEVELOPMENT.

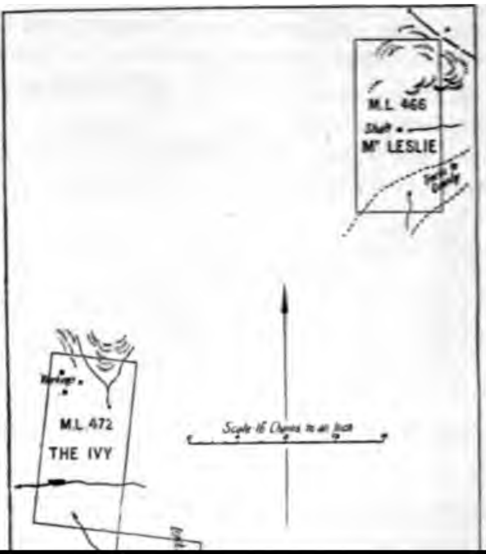
The main shaft, which is 7 ch. from the southern boundary, is 40 ft. deep; at the bottom there are drives for 30 ft. north and 20 ft. south; and above the former a stope has been carried up to within 20 ft. of the surface. No. 2 shaft, 50 ft. north of the main shaft, is 12 ft. deep. No. 3 shaft, 50 ft. further north, has been filled in to within 10 ft. from the surface with material from a trench running 12 ft. to the south. No. 4 shaft, 1 ch. north of No. 3, is 10 ft. deep. No. 5 shaft, about 75 ft. south of the main shaft, is 10 ft. deep. The only other workings are trenches 25 and 50 ft. south of No. 5 shaft, the former 20 ft. long and 6 ft. deep.

OUTPUT.

1905	12 tons shipped by Alman and party.
1906	53 ,, ,, ,, ,,
Total ...	65 ,, ,,

ORE-BODIES.

One ore-body, yielding over 50 tons of ore, has been located. and there is promise of several others being discovered by sinking on the line of strike, favourable indications having been already proved.



posed slate hanging-wall. Along the top of the stope there is 2 ft. width of copper-stained kaolinised and silicified rock, with a few inches width of gossan on the footwall. In the face of the northern drive also the ore has pinched down to 12 in. width, but is making again underfoot. The southern drive shows only 6 in. malachite, with patches of earthy secondary sulphide in the face, and the walls are ill defined, the gossan there being on the hanging-wall side. Most of the ore shipped must have come from these workings. The whole tip is cupriferous, and should yield between 2% and 3% copper.

No. 2 shaft met only very slight and occasional stains of copper.

No ore can now be seen at No. 3 shaft, which, however, was probably sunk on a bunch, on the line of that in the main shaft.

No. 4 shaft, the farthest north, was opened in kaolinised country, but seems to have cut the cap of an ore-body at 8 ft. depth, where there is dense limonite, with a little malachite, showing.

No. 5 shaft exposes formation, but no copper is present.

The first trench to the south of No. 5 shaft, however, shows 12 in. width of copper-stained and copper-bearing altered country rock. The second trench also shows slight stains, and about 5 ch. beyond, to the south, some copper stains and replacements have been located in kaolinised and brecciated slate.

Mount Leslie (M.L. 466).

Mgr., Henry.

LOCATION, ETC.

The Mount Leslie lies 1½ mile north-east of the Una.

Its area is 10 ac. Being deserted, it was not inspected by me.

LITERATURE.

(4) Mr. Cameron says of the old lease:

> A shaft sunk on Lease No. 36 some 50 ft. in depth, and a drive east some 50 ft., have failed to expose indications of copper, though I am informed blocks of rich ore were found on the surface.

(7) Mr. Rutherford states:

> From a small outcrop Mr. Henry sent away seven tons of red oxide, which assayed 43 per cent. Cu., all occurring within two feet of the surface in a concretionary form.

LADY CLAYRE GROUP.

The only mine in this group offering any encouragement to continued mining is the Dispute.

Lady Clayre (M.L. 279).

Mgr., O'Keefe.

LOCATION, ETC.

The Lady Clayre is situated on a low ridge 2½ miles north-west of the Una.

Its area is 10 ac.

DEVELOPMENT.

The main shaft on the centre line of the lease, 5 ch. from the northern boundary, is 45 ft. deep, and a crosscut is being carried eastwards at the bottom (16 ft. in, in November last). Another shaft, 1 ch. south of the main shaft, is 19 ft. deep. A pothole 5 ft. deep lies 4 ch. from the south-western corner; besides there are costeans, just south of the main shaft, nearly 50 ft. long, 4 ch. south of the southern shaft, 6 ft. deep and 30 ft. long, and 2½ ch. west-north-west of the main shaft, 30 ft. long.

LITERATURE.

For titles of reports, numbered as below, see Introduction.

(4) Mr. Cameron describes Lease No. 21 as below:

> . . . . The surface indications of copper have been prospected by three trenches, which expose vertical north and south, striking felspathic sandstones. The ore occurs mainly as carbonate along the bedding planes, and is associated with quartz in veins running parallel with the bedding. The most northerly cutting is 48 feet long and 10 feet in depth, and it exposes a belt of copper-bearing rock about 18 feet in width. The better ore has been picked from the gangue, and stacked on one side of the trench. An average sample of it gave a return of 15 per cent. of copper, a trace of gold, and 16 oz. 8 dwt. of silver per ton. The second trench lies about 25 yards further south, and is 40 feet in length, and about 10 feet in depth. It exposes a similar formation to trench No. 1, about 6 feet in the centre being copper-bearing. Picked ore from here gave a return of 26·4 per cent. of copper, a trace of gold, and 16 oz. 8 dwt. of silver per ton. About 70 yards further south is the trench, 30 feet in length, and 10 feet in depth. The copper-bearing rock here has narrowed considerably, being barely 1 foot in thickness. The ore apparently does not occur as a well-defined and regular lode, but is no doubt an impregnation of a narrow belt of rock. Its extension further north of trench No. 1 should be prospected by a series of cross trenches. Trench No. 1 shows that there is a good body of 15 per cent. ore to be got in its neighbourhood, but the ore does not appear to occur in any quantity further to the south. Several other outcrops of ore occur on the lease, but they do not as yet appear to be of much consequence.

ORE-BODIES.

Little of promise is to be distinguished here, the ore apparently occurring in small bunches. A lot of trenching has been done, the result of which has been recorded by Messrs. Cameron and Rutherford. The country rock is tilted slate (not sandstone) variously altered, chiefly by silicification, and one outcrop of limestone is to be seen on the lease. The general run is north and south, but, just to the north-west of the main shaft, the strike is west-north-west.

The main shaft has been sunk in slightly copper-stained gossany country to a "floor" at a depth of 19 ft., and similar country was met within 3 ft. of the shaft in the crosscut. This crosscut is being put in to test a belt of copper-stained and ferruginous country, exposed over a width of 25 ft. in a costean to the south of the shaft.

The southern shaft is sunk in slates, some parts of which are much silicified and bleached, while others are stained by malachite and contain bunches of fairly rich ore over a width of 6 ft. The rich ore consists of limonite, with some tile-ore and masses of malachite.

Several patches of carbonates in slate have been found to the south of this shaft, but in the southern costean only altered country with stains and small bunches of malachite-bearing slate are now exposed.

The western pothole shows impure limestone, across which a body of gossan, 12 in. to 18 in. wide, runs from east to west, probably on a joint. The gossan is rich in tile-ore and carbonates, and should yield 20% copper. A cherty quartzite lies to the east of the limestone, and on the edge of it a bunch of rich tile-ore and radiating malachite was found in quartz, the yield being 2 tons of 60% ore.

The western trench proved only copper-stained siliceous slate; but, at 1½ ch. north-west of the main shaft, there is a patch of gossan, with tile-ore and malachite, in silicified slate, from which 2½ tons of 30% ore could be culled.

Lady Clayre South (M.L. 413).

Mgr., Henry.

LOCATION, ETC.

This adjoins the Lady Clayre on the south.

Its area is 10 ac. The ground was deserted in November last.

One shaft has been sunk 10 ft., and some surfacing has been done.

ORE-BODIES.

Nothing is to be seen as to the nature of the ore-bodies, the trenches being in sintery red soil, probably produced by the decomposition of a ferruginous slate. Several tons of rich ore are stated to have been shipped from here, and there is paddocked 1 ton of siliceous limonite seconds, containing stains of malachite and specks of chrysocolla.

Dispute (M.L. 696).

Mgr., Botham.

Location, Etc.

The Dispute lies 20 ch. west of the Lady Clayre. When inspected, the ground was held as the Kathleen (M.C. 202).

Its area is 5 ac.

The main shaft is 20 ft. deep; a second shaft, 12 ft. deep, lies 12 ft. to the north; a third lies ½ ch. to the east; and a fourth is 1½ ch. to the south-east.

Output.

	15	tons shipped by different parties (report).
	4	,, at grass, carrying between 30% and 35% copper.
Total	19	,,

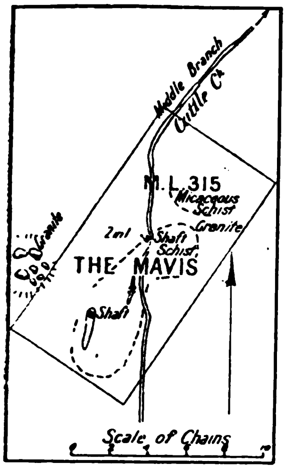
Ore-bodies.

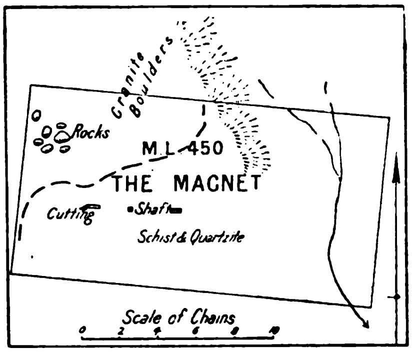
An oval area, 5 ch. in length (north and south) and 3 ch. in width (east and west), in which are the workings is worthy of thorough trial, the whole surface being more or less gossany. The area is on flat ground, and the easiest way to prospect it would be by sinking a central shaft and then cross-cutting and driving. The underlie will probably prove to be to the west, as the country dips in that direction.

A cellular gossan crop, with slight copper stains, runs for 2 ch. to the south-west from the main shaft. This should be tested by potholes or by a drive from the main shaft, at, say, 50 ft. depth. The main shaft itself is in a gossany formation, in which occur irregular bunches of limonite carrying malachite. This, though poor, offers every encouragement to further sinking.

LONGAMUNDI GROUP.

The Longamundi Group comprises several freeholds and leases on disconnected ore-bodies, of considerable interest, because of their varied forms.





Mavis (M.L. 315).

Mgr., McGrath.

Location, Etc.

The Mavis is located on Cattle Creek, 2 miles south-east of the Magnet and 1 mile from the Camooweal road.

Its area is 10 ac. At the time of my visit the lease had just been taken over by the Leichhardt-Cloncurry Company.

Development.

The main shaft, underlying 2 in 1 to the north-west, is sunk below the bank and beside the bed of Cattle Creek, and is reported to be 40 ft. deep, and to have been driven from. It is now used as a well, and is consequently not to be inspected below 30 ft. from the surface.

There is an old shaft, 10 ft. deep, 4 ch. south-west of the main shaft, and an old costean 3 ch. south of the same.

Output.

1905 ... ... 13 tons shipped from Mavis, etc.

Ore-bodies.

There is here an area of extremely metamorphosed rocks, irregularly intruded by granite. The lithological associations are indistinct, but the lease appears to be located near the periphery of the intrusive granite, the patches of black micaceous rock representing outlying "floaters" of intensely metamorphosed sedimentaries.

The deposits are of a most unusual kind, but nothing of any value is offering here. Alongside the main shaft is a dyke of pink granite, very fine in the grain, except for irregular patches of crystallised quartz and felspar giving it the character of a pegmatite. North-west of the dyke massive granite occurs, while on the south-east there is an outlier of dark schist. The shaft is sunk in a granular granitic rock—possibly a crystalline sedimentary—consisting of crystallised pink orthoclase, a little granular quartz, flakes of biotite (perhaps also with chlorite), together with some iron ore, sometimes present to the exclusion of all the other minerals. The whole of the rock is stained throughout with blue and green carbonates, but does not carry more than 1% copper. The iron ore appears to follow a joint as a footwall, and its crop can be traced for ½ ch. to the west-south-west, and to the creek drift ¼ ch. to the east-north-east. The crop of altered granite, 2½ ch. east-north-east of the shaft, is probably on the line. The iron has every appearance of being due to segregation from the intruding magma, while the copper may have been derived from basic minerals in the sedimentaries during their metamorphism.

A surface sample was taken from the material tipped alongside the shaft, but is probably too high in copper, which has been somewhat concentrated on cracks. It consists of one quarter chloritic quartz-felspar rock, stained with malachite and containing glance and also a little calcite: one half decomposed porphyritic schistose rock, stained with malachite and azurite, containing a little bornite and sometimes quartz-bearing; quartz, sometimes intercrystallised with felspar; and a little coarsely granular ilmenite with felspar phenocrysts in serpentinous rock. The following is the result of its

Its area is 19 ac. The lease is held under option by the Leichhardt-Cloncurry Company, but had only just been taken over at the time of my visit.

DEVELOPMENT.

The workings may best be described in their order from west to east. The first shaft is 17 ft. deep; a few feet to the east is a pothole; and 20 ft. to the east-north-east is an opencut, 45 ft. long, 6 ft. deep, and 5 ft. across. About 50 ft. east of the cut is the main shaft, 40 ft. deep, and 14 ft. beyond are two potholes 10 ft. deep. The only other excavation is a trench 30 ft. long and 8 to 10 ft. deep, 1¼ ch. east of the last.

OUTPUT.

1905	30 tons	shipped by R. Love.
1906	13 ,,	,, (Magnet)
Total ...	43 ,,	,,

ORE-BODIES.

There is here a series of over-lapping lenses, on a line which, east of the main shaft, lies approximately east and west, but on the opposite side gradually bends round, and in the western shaft has a strike of north-east and south-west, the dip varying from north to north-west, and amounting to 80°. The country rock adjacent to the ore-bodies is a dark mica-schist, the strike of which is generally east and west and in agreement with that of the ore-bodies. Local variations are noticeable, especially in the long cut and in the main shaft, where the schistosity abuts against the footwall as if on a cross-fissure. The wall-rocks are also there much kaolinised for 6 in. from the ore.

The ore-bodies would appear to be developed in mica schist along an imperfect line of fissures, directly due to the intrusion of the granite, which may be seen within 1 ch. west of the workings and 2 ch. to the north. The irregular contact of the two rocks, as far as visible, is the only evidence of the intrusive nature of the granite, the area to the north being, presumably, an off-shoot from the main mass to the west.

At the western shaft and pothole four separate cupriferous formations can be distinguished. The southernmost in the pothole, which is on the line of that exposed in the other workings, is probably only a bunch, 2 ft. 6 in. wide at the most. At 18 in. to the north-west a crop, 12 in. wide, runs between the pothole and the shaft; and 18 in. beyond it is a body, 3 ft. wide on the eastern side of the shaft, but only a few inches wide in the south-western corner of the same. The fourth body, which is separated from the last by 3 ft. width of quartzite, is 2 ft. 6 in. wide on the eastern side of the shaft, but tapers down to a few inches on the western. Ore has been shipped from this shaft, and the 7 tons of seconds, consisting of limonite and quartz, with malachite and a little enriched chalcopyrite, will probably average 10% copper, besides which the whole of the mullock tip should yield 2% or 3% copper.

The long cut is on a formation, 1 to 4 ft. in width, passing eastwards into quartzite, in which are occasional patches of carbonates. This can be followed almost to the main shaft, its width in one place being 10 ft. There are 7 tons of seconds at grass, very siliceous, coated with clay, and not likely to yield more than 5% copper.

The main shaft was begun on a formation, nearly 6 ft. thick. In this is a vein of gossan, which near the surface is 3 ft. wide in the eastern end, but pinches to 9 in. in the western end. Where thickest it is very siliceous, and probably does not contain more than 5% copper. Below a depth of 10 ft. the average thickness of well defined gossan on the western side of the shaft is 12 in. On the eastern side the lode pinches still further, being only 3 in. wide at 30 ft. below the surface. The whole of the material raised from the shaft shows traces of azurite, and the tip should carry between 1% and 2% copper. The paddocks hold 3 tons of gossany tile-ore and carbonates, which should run 20% copper, and 5 tons of siliceous ore worth 10% copper.

The first of the potholes exhibits a formation 7 ft. wide in the western end, and 2 ft. wide in the eastern, contracting downwards to 18 in. The seconds paddocked amount to 10 tons. They comprise siliceous gossan with carbonates, and are likely to yield 15% copper.

In the second pothole the formation increases from a width of 2 ft. 6 in. at the western end to 6 ft. at the eastern end.

The eastern trench exposes two over-lapping lenses of cupriferous gossan, perhaps 18 in. apart, the one being 12 in. wide at the western end, and the other 18 in. wide at the eastern end. The ore in the faces should carry 20% copper. The seconds, of which there are 3 tons at grass, are very siliceous, but will assay 15% copper. There is very of which few now show in the faces. Besides the 3 tons of ore bagged there are at grass 2 tons of seconds, very siliceous carbonate-bearing ore, the copper content of which does not exceed 10%.

Scanlan's (M.C. ?).

Mgr., Scanlan.

LOCATION, ETC.

Scanlan's lies only ¼ mile south of O'Brien's.

It was idle when visited, and only one hole has been sunk 6 ft.

OUTPUT.

1906 ...	... 2 tons of ore at grass.

ORE-BODY.

A lenticular body of ore, striking north and south and dipping westwards, is being opened in schist country. The ore consists of limonite and enriched chalcopyrite, with stains of malachite, and appears to be rich in copper. There is little quartz at the hole, but that mineral becomes more plentiful to the south.

Havelock (P.A. ?).

LOCATION, ETC.

The Havelock lies 1 mile south-east of the Patchwork.

Several small bodies of ½ to 2½ tons of ore have been found, but no defined lode has yet been located.

Patchwork (M.C. 349).

Mgr., Lanson.

LOCATION, ETC.

The Patchwork lies about 2 miles south of the Dugald Crossing on the Camooweal road.

Its area is 200 ft. × 350 ft.

A shaft has been sunk 15 ft., in the north-western corner of the claim; 3 ch. to the east-south-east is a hole 10 ft. deep; and, for 4 ch. to the east-south-east from here, a string of potholes extends.

ORE-BODIES.

The north-western shaft is in a break in the schists, striking north and south and dipping 4 in 1 to the east, here and there along which small bunches of cupriferous quartz are found. This does not appear to be worth any more attention. The 2 tons of seconds, at grass, comprise quartz, with a little chalcopyrite in the solid part and tile-ore and carbonates in cracks; and they may carry 2% copper.

The first hole to the east-south-east was sunk on a bunch of ore, running west-north-west, which has now been stoped out.

The potholes to the east-south-east appear to have been opened on small bunches of copper ore and of quartz carrying magnetite, no body of which has, however, been proven, though a formation 2 ft. 6 in. wide is exposed in one of the holes.

The deposits are valueless copper propositions, but the occurrence of the iron ore is interesting.

Two Sports (M.F. 2874).

Mgr., Henry.

LOCATION, ETC.

This is on the western side of the Dugald River, 1 mile above the Camooweal road crossing and 38½ miles north-west of Cloncurry. When visited by me a claim known as the Two Sports had been pegged out, there being nothing to indicate that the ground was freehold.

Its area is 31 ac.

The Dugald valley is here flat bottomed or only slightly rolling to the hills 3 miles to the west.

DEVELOPMENT.

Most of the workings described below are due to prospectors, who have held the ground in ignorance of the fact that it is freehold.

The northernmost opening is a pothole (*a*); 5 ch. to the south is a costean (*b*), 4 ft. deep and several feet long; then, 5 ch. to the south-south-east of the last is a trench (*c*), 15 ft. long and originally 10 ft. deep; 30 ft. beyond is a hole (*d*), 5 ft. long, 10 ft. wide, and 5 to 10 ft. deep; 1 ch. further to the south-east is a pothole (*e*), 3 ft. deep; ¾ ch. east-north-east of the last is a pothole (*f*), 5 ft. deep; and 3 ch. east- [redacted]

Between the costean (*b*) and the trench (*c*) the country becomes much more ferruginous, and in the sides of the trench spotted schist with much silicified limonite can be seen. There are 2 tons of ore bagged here, and also 3 tons of ferruginous seconds, which may carry 3% copper.

The tip at the hole (*d*) contains a large amount of gossan. There seem to be two separate lenses of ore in this excavation. They are now covered by rubble, but are said to be strong in the bottoms of the workings. The firsts bagged amount to 9 tons, and the seconds, carrying 3% copper, to 8 tons. This hole is on the line of the main outcrops of the freehold, which appear at 5 ch., 8 ch., and 11 ch. to the south, but have not elsewhere been broken into.

The potholes (*e* and *f*) exhibit only stained spotted schist.

In the trench (*g*) a lenticular bunch of gossany ore would seem to have been worked, but in the end only a few inches of blackened limonite, dipping flatly northwards, can be seen. One ton of firsts is stacked at the trench, and there is near at hand 1 ton of gossany seconds containing 1% copper.

The potholes (*h*) are in copper-stained spotted schist, and 2½ tons of ore, now bagged near them, have been obtained from bunches of ore.

The newest hole (*i*) is also in spotted schist stained by malachite, and containing irregular splashes of cuprite. In working, green-stained cracks are followed till irregular veins and bunches, generally less than 1 in. thick, of cuprite are found, sometimes with a little native copper. Only ½ ton of rich firsts were bagged here, but there was also 1 ton of seconds, schist with veins of cuprite and stains of malachite, estimated to contain 25% copper.

The schists are stained to a limited extent for 1 ch. south of the hole. The southernmost costean shows very slight stains of copper in places. Some prospecting should be done on the gossany crop to the south-south-east of this.

Unnamed (M.F.'s 2873, 2902, and 2903).

LOCATION, ETC.

These freeholds lie 1½ mile west of M.F. 2874 on the Dugald River.

Their areas are 21 ac., 20 ac., and 20 ac., respectively.

LITERATURE.

(2) Mr. Jack refers to several copper and lead lodes in this district, but his description of location is insufficient for it to be stated that they are on these freeholds.

> . . . . The lead selections lie nearest the range, and occur in a wide lode which can be followed on the surface for nearly a mile, from north 20 degrees west, to south 20 degrees east; not only by the continuous outcrop of gossan,

but also by the absence of vegetation. At the north end is a mass of gossan, stained with carbonate of copper, and mixed with plumbago. . . . A mile to the south-east of the lead lode is the No. 1 Copper Selection. It lies among upturned and altered stratified rocks. Near the river is a white crystalline limestone, 50 or 60 feet thick, with siliceous granules, and specks of black mica, dipping at 75 degrees to east 10 degrees south. Below the limestone is a series of grey siliceous and talcose slates or shales, impregnated and coated with green carbonate of copper. This series is of varying thickness—at least 100 feet—and is accompanied by a weathered granular siliceous and hornblendic rock, impregnated with carbonate of copper ("green gossan"), especially in the form of amygdaloidal kernels. These masses evidently are not part of the stratified series, but vein deposits or gangue, as they intersect the bedding in places, although their general tendency is to follow it. Two trenches have been cut across the outcrop of the cupriferous zone or lode (which runs north 10 degrees east). One trench is 22 yards long; it discloses a considerable quantity of the "green gossan," which cuts in and out of the bedding of the stratified rocks. The second trench is 20 feet long and 8 feet deep; it shows towards the bottom large blocks of ruby oxide coated with green carbonate, and frequently containing veins of native copper. The oxide is remarkably pure. Besides the "green gossan" large masses of ferruginous gossan occur on the cap of the lode. Large lumps of carbonate and oxide of copper can be picked up loose in the gullies near the lode.

CABBAGE-TREE GROUP.

Cabbage-tree Creek is a tributary of the Leichhardt River, but it is convenient to include these workings under the heading of Dugald River.

It was learnt from prospectors that there is an extensive cupriferous belt along the right bank of Cabbage-tree Creek, but that the ore-bodies themselves are small.

Cabbage-tree (M.F. 3072).

LOCATION, ETC.

This is on the eastern side of Cabbage-tree Creek, 4½ miles

GLENROY.

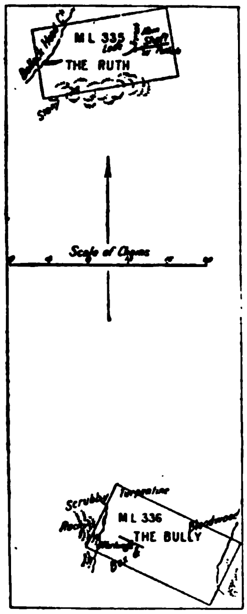
Glenroy is a station on the Leichhardt River, 53 miles west-north-west of Cloncurry.

The two groups are located on the divide between the river and Prospector Creek, which lies to the east.

MOUNT REMARKABLE GROUP.

Mount Remarkable is a conspicuous table-topped range, running for several miles along the western side of Prospector Creek, and beneath the northern end of it the Cloncurry-Camooweal mail road runs.

On the Bully very little work had been done at the end of last year, and, being then deserted, the lease was not visited.



Ruth (M.L. 335).

Mgr., Fisher.

LOCATION, ETC.

The Ruth is situated on a small branch (Bullockhead Creek) of Prospector's Creek, ½ mile from the Camooweal road and 50½ miles north-west-by-west from Cloncurry.

Its area is 10 ac.

The main shaft is 30 ft. deep; 1 ch. to the east there is a hole 8 ft. deep; 4 ft. to the south there is a trench, 10 ft. long; 12 ft. to the west there is a cut, 12 ft. long and 20 ft. deep; and 3 ft. beyond this a trench, 12 ft. long and 4 ft. wide, has been sunk 5 ft.

The mine happened to be deserted when visited, the leaseholders having left for Cloncurry to obtain rations.

OUTPUT.

1905 ...	... 18 tons shipped.	
1906 ...	... 39 ,, ,,	
Total	... 57 ,, ,,	averaging 25% copper.

ORE-BODIES.

This appears to be a mineralised zone, in which there are probably numbers of ore-bearing lenses, but there is no sign of fissuring. Iron-stained quartzite, in which a few small patches of copper-ore have been found, forms a prominent crop, rising 15 ft. above the creek at the western end of the lease.

The crop is 3 ch. in length and up to 20 ft. in width at the western end. It strikes west-south-west and dips steeply south-south-east. Towards the west it is made up of alternating quartzite lenses, granular quartzite and crushed schist, most of the copper being in the last and none in the first. The average content is less than 5% copper, though the green surface stains might lead one to expect a higher percentage. The occurrence is thus almost exactly similar to that on the Chinaman freehold at Duck Creek. The central part of the crop is rather gossany, and patches of ore may be expected if it is

In the western pothole there is 6 in. gossan and cupriferous formation, and several tons of gossan, carrying 5% copper, could be picked from the tip.

The first trench, to the west of the shaft, exposes 18 in. gossan at its eastern end, but at the western only 3 ft. of ill-defined gossany formation can be made out.

HAMILTON CREEK GROUP.

Hamilton Creek is a tributary of Prospector Creek, about 10 miles east of Glenroy homestead.

The group includes the following, which have been taken up since my visit to the district:—

Brideson's "Manxman" (M.L. 695), 10 ac.
Kennedy's "Mount Olive" (M.L. 674), 10 ac.
Brown's "Gipsy's Warning" (M.L. 682), 10 ac.
Smith's "May Queen" (M.L. 683), 5 ac.

Yamamilla (M.F. 2885).

LOCATION, ETC.

The Yamamilla is located on the head of a creek of the same name, within the catchment area of the Dugald River. It, however, is really in the upper Prospector Creek group of ore-bodies.

Its area is 20 ac.

LITERATURE.

For title of reports, numbered as below, see Introduction.

(4) Mr. Cameron wrote of the freehold:

> . . . It shows an enormous reef of white quartzite running through the property in a north and south direction, and forming the backbone of the ridge through which Yamamilla Creek cuts near the northern boundary. The outcrop thus exposed stands out as a solid wall running down to the spur of the ridge some 20 feet high and 15 feet across. The face of the wall is cavernous, and stained green with copper salts. It shows the reef to consist of broken fragments of quartz cemented together by secondary silica, and with copper carbonate scattered through it. A sample of some of the best ore gave a return of 9·9 per cent. of copper, a trace of gold, and 3 oz. ·7 dwt. of silver per ton. There does not appear to be any great body of ore present on the surface, and the lode evidently gets poorer as it is traced to the south. The quartzite on the whole has a very hard and barren appearance, the patches of ore being detached and comparatively scanty. The rich colouring of the surface of the lode is easily explained by the readiness with which copper is dissolved out and distributed by water, the colouring being in many instances merely a coating of carbonate on the lode material.
>
> *Lease* No. 159 is taken up on the continuation of the quartzite beds in the Yamamilla. It does not show much indication at present of being rich in copper.

(7) Mr. Rutherford states:

It is taken up to include a quartz outcrop running north and south in a country of quartzite. The northern end has been cut through by a creek, which shows that in depth the outcrop splits into two branches. Forty feet above the level of the bed of the creek and south from it, the outcrop shows as a mass of quartz 15 feet high and 17 feet wide, stained with carbonate. To the north this blow splits into two branches, running for a distance of eighty yards to the creek and showing for some distance beyond. These branches, like the rest of the outcrop, are composed of blocks of quartz cemented together and showing carbonate stains in joints. They become narrower and poorer in depth as the hill is descended, and in the bed of the creek show from 1 to 2 feet wide with few stains. Continuing the blow to the south it is found to bifucrate also in this direction. The eastern branch can be traced only for a few yards, but the western branch is marked by a fairly well defined line of quartz running into "Mount Hood" (Lease No. 159, 20 acres), adjoining to the south. This southern part of the outcrop is much less stained with carbonate than the large blow. This is not a true outcrop, but a deposition of silica containing copper along the bedding of the altered sandstone. The vivid green colour is due to a thin coating of the rock, and a bulk assay right across the quartz would not show more than a trace of copper.

PROSPECTOR CREEK.

Prospector Creek runs northwards from near the head of the Dugald to the large east and west stretch of the Leichhardt River.

Only five groups are here mentioned, but they do not include every show in this part of the district that has been tried at one time or another.

The creek drains a wide flat-bottomed valley, fairly well timbered with stunted box, with bunches of gidia and bloodwood in the lower part.

MOUNT METALLIC GROUP.

This group is on the western side of the creek, about 3 miles north of the Camooweal road. Included in it here are several holdings lying to the west and south-west not visited by me.

The country is characterised by the presence of much limestone, in which, however, no trace of fossils can be detected, for the region has undergone considerable metamorphism. In the vicinity of where the miners camp at the White Gorge, within a mile to the north of Mount Metallic, the limestones are thin bedded and strike north 10° east, and here some small lenses of hæmatite have been developed. Northwards towards the Dreadnought there seem to have been thicker beds of limestone, in which crystalline quartz has been deposited. Ferruginous chalcedony has also subsequently been introduced, replacing most of the limestone and cementing the broken fragments of quartz. Silicification, with consequent induration, has also been particularly intense over whole beds of slate, in which the deposition of silica has been not only in cracks and joints but throughout the body of the rock. The superior resistance to denudation of the resulting rock causes it to stand out as a rampart, often forming the backbone of a hogbacked mountain. By many of the miners the crops are looked upon as caps of huge lodes.

Mount Metallic (R.C. 310).

Mgr., Price.

Location, Etc.

Mount Metallic is located on the divide west of Prospector Creek and 2½ miles north-west of the Camooweal mail road crossing. The hogback on which it is situated converges towards the White Gorge range.

Its area is 40 ac.

Development.

No. 1 shaft, 10 ft. deep, with opencuts extending 6 ft. south-east and 15 ft. north-west, is a little south of the middle of the claim. Between this and the main (No. 2) shaft, 1 ch. to the north-west, there are two opencuts, 12 ft. and 10 ft. in length and 8 ft. deep. No. 2 shaft is 28 ft. deep and underlies 2 in 1 to the east. No. 3 shaft, 20 ft. to the north-north-west, is 47 ft. deep, and inaccessible. From this an opencut, 10 ft. deep, continues for 25 ft. northwards. No. 4 shaft is 4 ch. north-north-west of No. 3, and is 20 ft. deep. In addition to these workings there is an opencut, 10 ft. deep, running for 30 ft. west-north-west from the opencut at No. 3 shaft.

OUTPUT.

Prior 1906	... 45	tons shipped, carrying 35% copper (*fide* Mr. Price).
1906	... 25	,, ,,
Total	.. 70	,, ,,

ORE-BODIES.

The crop, at the south-east, comprised cellular limonite, with melaconite (?) and malachite lining cavities. The ore-body, in the No. 1 shaft and the adjacent opencuts (where, however, there are strings in the footwall for 12 in. from the ore-body), is only 6 in. wide. But the limonite there carries chalcopyrite, enriched by chalcocite, while a little jagged (crystalline?) native copper has been found, embedded in cuprite, which gradually shades off into limonite, mammilary on cavities. There is now 15 cwt. of native copper and cuprite at the shaft. The strike of the lode here is north 28° west, its inclination being almost vertical. The country rock is a siliceous cherty slate.

Very little ore can be seen in the northern end of No. 2 shaft, but the seam, dipping 2 in 1 eastwards, on the southern end averages 12 in., of which the 4 in. on the hanging-wall is chalcopyrite enriched by chalcocite, while the remainder is a siliceous skeleton with a little crystalline malachite. The copper ore is increasing somewhat towards the bottom, where tile-ore is also appearing. The walls here are well defined, but show no slickensides, though irregular polished vertical

It is reported that there is 2 ft. of ore in the bottom of No. 3 shaft, but, in the end of the opencut to the north, the width is only 9 in. The country here appears to be strikingly obliquely to the ore-body.

The practically vertical streak of rich ore, beside 3 or 4 in. gossany kaolin, in No. 4 shaft is only 1 to 3 in. thick, except at the bottom of the shaft, where the gossan is 12 in. wide at the northern end. The eastern slate wall in places is very well defined, and, if followed, may lead to a bunch of ore. The 2 tons bagged at the shaft comprise silliceous tile-ore and chalcocite-chalcopyrite, and are expected to yield 30% copper.

The cut west of No. 3 shaft exposes 3 to 6 in. gossan, which, though in the cut reported to be 2 ft. wide in places, appears to follow a west-north-west striking joint, dipping 6 in 1 to the north-north-east. The walls are strong, but the hanging-wall country is altered for 18 in. from the ore, and is very gossany. The gossan can be traced for several chains to the west of the cut.

The Mount Metallic country would seem to be on the continuation of that on which is the Dreadnought, and though no limestone was seen on the claim it is known to occur on the hill to the south.

Queenslander (M.L. 436).

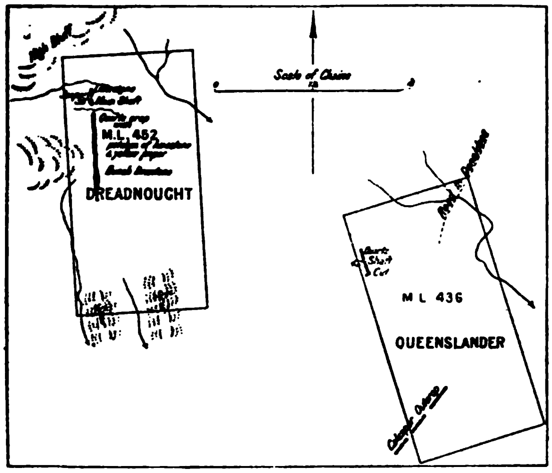
Mgr., Price.

LOCATION, ETC.

The Queenslander lies north 33° east from Mount Metallic, at a distance of 1½ mile.

Its area is 20 ac.

Only one shaft and a pothole have been sunk on this lease, the former to a depth of 45 ft., and the latter 6 ft. A drive is being carried southwards from the shaft bottom.



OUTPUT.

	4	tons shipped, carrying 35% copper.
	6	,, ,, ,, 22¼% ,,
1906 ...	7	,, ,,
Total	17	,, ,,

ORE-BODIES.

The ore-body appears to run south 25° east from the main shaft, and traces of copper can be found for nearly a mile in that direction, but exposures are few and far between. Quartz fragments are scattered over the surface for 40 ft. north of the shaft.

At the main shaft the crop is a somewhat gossany and copper-stained material, which passed at 32 ft. depth into a sintery formation, carrying bunches of copper ore, yellow jasper, and brown calcite, 15 in. wide at the northern end and 3 ft. wide at the southern. The footwall, on which there is 6 in. of crushed lime-bearing slate, is well defined, and dips 1 in 4 to the east-north-east, but no hanging-wall can be distinguished. Bunches of rich ore have been found in the drive for 8 ft. from the shaft, especially about 2 ft. from the footwall. Some 10 tons of ore have been shipped from this shaft, there are 25 tons of seconds, carrying 16% to 18% copper, at grass, and the whole tip will carry between 5% and 10% copper. The last 1½ ton of ore raised, and waiting to be sorted, should yield 28% copper. It consists of chalcopyrite, intimately associated with chalcocite, a little earthy lime, and quartz, and shows some stains of malachite. The same quantity of firsts, paddocked and comprising nearly pure chalcopyrite-chalcocite ore, is expected to assay 48% copper.

12 in. wide at the surface, in schist, dipping 70° to the south-west, and traceable for 3 ch. to the north-west. Only 2 tons of 24% ore have been taken from here.

Dreadnought (M.L. 452).

Mgr., Donner.

LOCATION, ETC.

The Dreadnought, formerly held as M.L. 115, lies ¼ mile west of the Queenslander, and ½ mile north-north-east of the White Gorge.

Its area is 20 ac.

A shaft has been sunk, 4 ch. south-east of the north-western corner peg, to a depth of 30 ft., and a contract was let at the end of 1906 to continue the shaft to a total depth of 67 ft. It is proposed to cross-cut east and west at the 50-ft. level.

ORE-BODIES.

The main outcrop, in which is the shaft, consists of limestone, replaced by silica and limonite, some of which is very cellular. It is 40 ft. in length and perhaps 15 ft. wide, though boulders of the rock are spread over a width of 30 ft. Interesting specimens are here available of ferruginous, granular quartz, pseudomorphous after calcite, as proved by a well-marked rhombohedral cleavage exhibited.

The sinking in the shaft was silicified limonite or ferruginous jasper, the 35 tons of which at grass will probably run 3% copper, but are valueless because of the very high silica content. The lower part of the shaft is just passing into soft kaolinic formation, which, however, contains no copper. The limonite is in bands, which dip 60° to the west; that at the 14-ft. level contains bunches of pyrite as well as copper stains. Sinking and cross-cutting appears to be justified.

An area of limestone, 10 ft. in diameter, is to be seen on the northern side of the ferruginous crop, and, 20 ft. south of the shaft, there is a crop of barren quartz, showing some patches of limestone, silicified limestone, and silicified limonite. This crop is 7 ch. in length and up to 15 ft. in width.

Other irregular crops of limestone occur 10 ch. south of the Dreadnought. There are also areas, up to 40 ft. and even 50 ft. wide and 4 ch. long, of "pudding-stone," consisting of angular quartz cemented by a ferruginous chalcedony (silicified limonite), beneath which copper ores may be found.

Kangaroo (P.A. 261).

Mgr., Price.

LOCATION, ETC.

The Kangaroo lies 4 miles west of the Mount Metallic.

Its area is 40 ac.

There is one opencut 30 ft. long and 16 ft. deep.

OUTPUT.

4 tons trial shipment, 22% copper.

Great Northern (P.A. 242).

Mgr., Price.

LOCATION, ETC.

The Great Northern lies 5 miles north-north-west of Mount Metallic.

Its area is 20 ac.

Only cuttings have been opened, and no ore has been shipped.

ORE-BODY.

Mr. Price reports an outcrop showing ironstone and limestone, over a width of 80 ft., running for ½ mile, and rising in places 50 ft. above the flats.

Lady Ethel Florence (P.A. 265).

Mgr., Price.

LOCATION, ETC.

The Lady Ethel Florence is 2 miles west of the Great Northern.

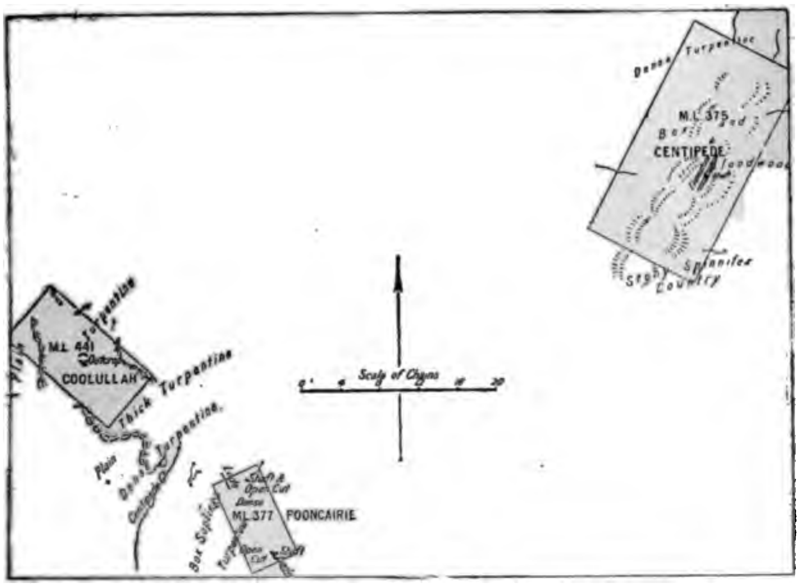
Its area is 160 ac.

Only shallow cuttings have been made here.

OUTPUT.

CENTIPEDE GROUP.

This group comprises four leases in the vicinity of the junction of Prospector Creek with the Leichhardt River. None of them had been worked for a considerable time, and it was found possible to locate only the Centipede in the time available.



On the Coolullah (M.L. 441) and Emerald Hill (M.L. 440) no work has been done.

Centipede (M.L. 375).

LOCATION, ETC.

The Centipede is located within the catchment area of the creek of the same name, 5 miles south from the junction of Prospector Creek with the Leichhardt River. This is in a region of broken gullies and low hills, extending for miles to the south-east from the Prospector Creek flood plain.

The area of the lease is 28 ac.

LITERATURE.

For title of report, numbered as below, see Introduction.

(4) Mr. Cameron wrote:

> *The Centipede* is a lenticular bed of limestone at the southern end, containing copper disseminated in particles through it. Two trenches have been put into it on its western side, but do not disclose ore of any great prospect. Further north the limestone is replaced by silica, and shows some likely-looking patches of cupriferous material.

DEVELOPMENT.

The lease had long been deserted, and was only found after long search by my blackboy. There is one trench 15 ft. long, and 15 ft. west of it is a shaft, 35 ft. deep, from the bottom of which, it is said, a crosscut runs 18 ft. to the east. Other trenches have been made 10 ch. to the south-south-west.

ORE-BODIES.

To the north-east of the lease many north and south belts of silicoous limestone were observed in slate and schist country. The limestones towards the west have lumps and veins of quartz segregated in them, and occasionally quartz is found to replace the whole width of a bed over a distance of from 1 to 5 ch. and a width of up to 1 ch., when they often rise 50 ft. above the general level of the ridges. In the vicinity of the lease bunches of gossan and traces of copper are also found.

The trench has been opened in a ferruginous crop of limestone, 15 ft. wide, which strikes north-north-east and dips 70° westwards. It exposes only 4 ft. width of quartz and siliceous copper-stained limonite in limestone. Very small splashes of chalcopyrite and erubescite were noticed in the solid quartz, and of chalcopyrite in the limestone, from which a little malachite weathers out. There are 2 cwt. of green-stained limonite at grass which may yield 2% copper.

The shaft has been sunk to prove this body at a depth. The upper part is in friable slaty rock, and at 30 ft. from the surface siliceous and ferruginous limestone, carrying only slight stains of copper, has been struck. No further work is warranted here.

The southern workings are in a big blow of ferruginous lime-the eastern wall of the lode is down 35 feet, and a drive to the west just above the water-line has passed through 18 feet of the siliceous outcrop. Mr. Green, who visited the locality some months after our first visit, says that the siliceous rock does not contain the same amount of copper in the drive as on the surface. The lode is apparently secondary silica dissolved out from the schists on either side, and has become impregnated with copper leached out also from the country rock.

ORE-BODIES.

Ruby ore is said to have been found here, but no mention is made of any body of ore, the shaft being sunk in soft country.

SURPRISE GROUP.

The group is located in the rather inaccessible mountainous country between the Pinnacles and Prospector Creeks.

No particulars are available of the Surprise* (M.L. 261), Surprise South† (M.L. 262), and Mount Ferrum (M.L. 443), of which the first two are 5 miles north-east of Mount Metallic, and the last is within a mile north of the Pinnacles waterhole on the Camooweal road, midway between Cabbage-tree and Prospector Creeks.

Jumbo (M.L. 442).

Mgr., Power.

LOCATION, ETC.

The Jumbo adjoins the Surprise on the north-west.

Its area is 30 ac.

ORE-BODY.

Mr. Cherry, in 1903, reported here "a very large and continuous quartzite outcrop . . . which shows traces of carbonates."

---

* The manager of the Mount Cuthbert reported late in this year (1907) that a well had been sunk as well as an underlie shaft 28 ft. deep, on a promising lode.

† The manager reported in October, 1907, that a costean had been put across the lode showing it to be 12 to 14 ft. wide, and to consist mostly of gossan and siliceous iron, copper stained.

LEICHHARDT RIVER.

In speaking of the Leichhardt River mines those on the big bend are always meant, as otherwise it would be necessary to include a region nearly 100 miles in length. The groups included are the Mount Cuthbert, Mighty Atom, and Jessie's Dream, practically all within the catchment of Six-mile Creek.

Schists, with lenticular beds of limestone and huge outcrops of quartzite, are characteristic of the eastern portion of this district, but westwards porphyritic rocks are present in great abundance.

MIGHTY ATOM GROUP.

The mines of this group are almost all located in the flat-bottomed valley drained by St. Paul's Creek (running northwards) and Six-mile Creek (running southwards). The surface is covered with angular quartz and ironstone gravel, and carries only a thin sprinkling of stunted mountain gum and spinifex.

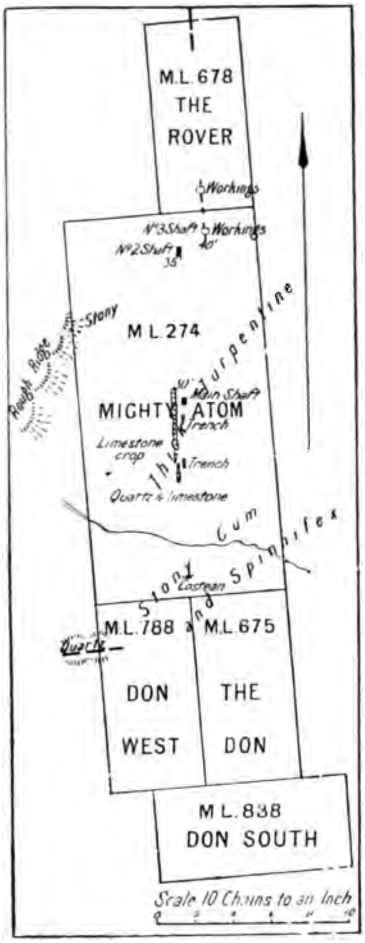
The country is similar to that within the Prospector Creek catchment in showing crops of bedded limestone replaced to a greater or less extent by quartz and accompanied by some copper ore, quite possibly precipitated by the action of the lime.

A note may be made here of the rumoured occurrence of alluvial gold, at the head of Copper-mine Creek, within a few chains to the north of the Mighty Atom. Mr. McKeand reports colours to be well distributed, and on one occasion discovered a $1\frac{1}{2}$-dwt. slug. We are unable to do any prospecting, as the gullies were dry.

The workings, which are the result of the Melbourne Coolullah Option Syndicate's tenure, have been so long (about six years) standing that the exposures in them are of little use.

OUTPUT.

18 tons shipped, carrying 24½ to 43½% copper.



ORE-BODY.

The Mighty Atom workings lie along, or adjacent to, the **outcrop of a bed** of quartz-veined limestone, replaced to some extent **by iron and** silica.

For 5 ft. east and 5 ft. west of the shaft in the southern **costean, the country** (soft schist or slate) is more or less cupriferous, **the mixed azurite**, malachite, glance, and tile-ore occurring in small **irregular masses** with a little chrysocolla. There is no defined **ore-body, but,**

just east of the shaft, there is a band, 18 in. to 2 ft. wide, of more richly cupriferous and ferruginous country, which dips 85° to the east 5° north. Possibly payable, but low-grade, schist will be found below. Only 5 tons of 39% ore have been shipped from here, but there are 15 tons of seconds at grass, chiefly kaolinised slate, which may carry 10% copper and are almost free from quartz.

Across the gully to the north of the costean there is a crop of gossan and yellow jasper giving way northwards to limestone, alongside of which is the first trench, from which 9 tons of ore, containing 43½% copper, have been shipped. The 3 tons of seconds (malachite and tile-ore in limonite with a little quartz) left, carry 20% copper. Nothing can be seen of the ore now in the trench.

The second trench is on the eastern side of the continuation of the limestone, which is there quartz veined, but nothing can be made out in it. It is said that some soft black gossan was raised, and that 3 tons shipped yielded 24½% copper. There are also at grass 3 tons of siliceous limonite carrying fine-grained tile-ore, glance, and malachite, worth perhaps 5% copper.

Quartz crops 5 ft. west of No. 1 shaft, beyond it there is 5 ft. width of chrysocolla-bearing country, and then 21 ft. width of crystalline limestone, the first 12 in. of which is schistose. The shaft is sunk in limestone and sinter, but 1 ton of ore has been shipped, and there are a few hundredweights of fine-grained, oxidised, 30% ore at the brace. Mr. Keand informed me that 25 tons of 35% ore have been shipped from this shaft and the adjacent trenches, but only a few tons of 20% oxidised ore can be seen at the surface now.

ORE-BODY.

The hole exposes country veined with gossan, over a width of 8 ft. at the northern end, and, at the southern end, there are 12 in. width of solid limonite and 18 in. of cellular gossan, underlying 6 in 1 to the east 5° north. The gossan can be traced southwards to No. 3 shaft on the Mighty Atom, and northwards for 1 ch. within this lease. The crop is worthy of further attention, for, though there is little copper at the surface, rich ore is to be expected towards water level.

Mount Millicent (M.L. 663).

Mgr., McDonald.

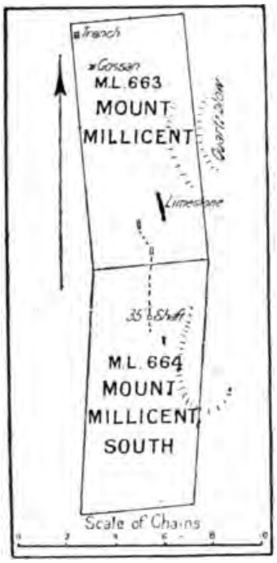
LOCATION, ETC.

Mount Millicent is ½ mile south of the Mighty Atom.

Its area is 5 ac.

DEVELOPMENT.

Only three trenches have been opened on this lease. The northernmost, 12 ft. long and 5 to 8 ft. deep, is in the north-western corner. Another, 10 ft. deep, is ½ ch. north of the centre of the southern boundary, and the third, 15 ft. long and 5 ft. deep, is 1½ ch. to the north-west of the second.



OUTPUT.

16½ tons shipped, averaging 30% copper

ORE-BODIES.

The country here is schist, but the southern workings are in the vicinity (to the west) of a crop of limestone.

The northern trench is in altered slate country, on a bunch of siliceous, oxidised, chalcocite-bearing ore, from which 2½ tons of 30% ore were bagged.

There is a small crop of very promising cupriferous gossan, worth opening up, 2 ch. south-east of this trench.

Bunches of pure cuprite were found on the surface, where is now the southernmost trench, in the northern end of which can be seen 15 in. cupreous limonite, though at the southern end there is only 9 in. width of soft ferruginous clay. In the middle of the cut 6 to 12 in. width of chalcocite-bearing carbonate-oxide ore is exposed, and is worth sinking on. The ore-body dips 10 in 1 to the east, and is bounded by schist, strongly foliated, on the west. In all, 12 tons of medium-grade ore have been shipped from this trench, and there are at grass 2 tons of ferruginous but quartz-free malachite and chalcocite tile-ore, expected to yield 30% copper. This body can be traced for ½ ch. to the north, when it probably bends round towards the central trench.

In the third trench is to be seen a 6-in. sandy, ferruginous seam, with a general north-north-west strike, but bending round towards the south-east at the southern end. Stacked alongside there is ¾ ton of siliceous oxidised ore (quartz-bearing limonite with chalcocite-enriched chalcopyrite having acicular malachite in cavities) containing between 15% and 20% copper, and 50% silica.

It is 1 ch. to the north-east of this trench that the brownish granular limestone crop, referred to, begins. The bed is 1½ ch. in length and 12 ft. wide near the centre.

iron-stained country, beyond which the slate is kaolinised and bleached. The hole south of the shaft is being opened in kaolinised slate alongside a band of gossan.

The shaft is sunk in kaolinised slate with iron-stained joints and very occasional bunches of copper ore. A drive to the north had just been begun, and already bunches of mixed tile-ore and crystalline malachite, as well as of mixed limonite-chalcopyrite-malachite, embedded in kaolin, were being met, warranting the continuation of the drive. There is stacked at the shaft 3 tons of chalcocite-enriched oxidised ore, likely to yield 50% copper, and very low in silica; and in addition there is 1 ton of chalcopyrite-chalcocite ore of 30% grade.

To the east of the Mount Millicent leases there is a low quartzite ridge.

Mount Bornite (M.L. 376).

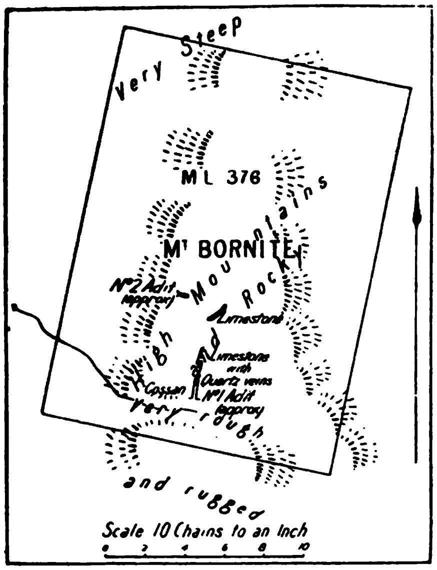
Mgr., Power.

LOCATION, ETC.

The Mount Bornite lies 1 mile south-west of the Mighty Atom, and 1½ mile north of McDonald's camp on the Mount Cuthbert track, being on the steep western slopes of the hill of the same name.

Its area is 30 ac.

Two adits have been opened on this lease: No. 1, near the southern boundary, is 100 ft. in length; and No. 2, 5 ch. to the north-north-west, is stated to be also 100 ft. long, but has now fallen in.



ORE-BODIES.

The country rocks in this vicinity comprise breccias, schists, quartzites, and limestones, having a general north and south strike.

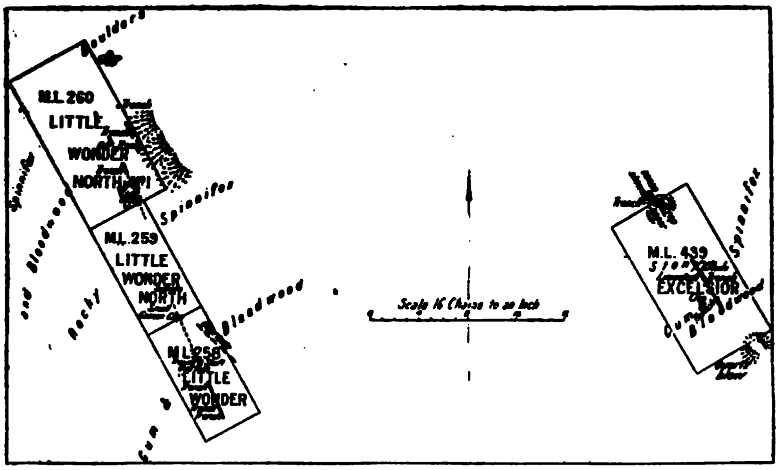
Gossan shoads are very abundant on the steep slopes below No. 1 adit, and most of them have presumably been shed from the ferruginous crops of the limestones, in one of which is the No. 1 adit. Just above the adit it has the appearance of a siliceous gossan, up to 6 ft. in width and of some promise. This continues for a distance of 25 ft. to the north, where it gradually passes into quartz-bearing limestone, in which the amount of quartz diminishes to a negligible quantity, about 1 ch. from the adit. This bed of limestone cuts out at 2½ ch. north of the adit, but a second crop appears 1½ ch. further north. This is also veined with quartz, and contains small patches of copper ore. The crop is irregular in shape, as is not unusual in organically derived limestones. Slight copper stains were noticed still further to the north.

No. 1 adit was opened in schistose slate, but after a few feet enters and runs northwards in bluish, silky crystalline limestone. The limestone contains numerous gash veins of barren quartz and in the adit is very cavernous, the spaces being very often partly filled with gossan. The iron content of the rock is very high, and a complete chemical analysis would probably prove it to approximate to ankerite. In all, 4 tons of this gossan have been collected and stacked at the mouth of the adit. It contains much chalcopyrite, in process of conversion externally into chalcocite, together with a little malachite and tile-ore, and the proportion of silica is over 50%, the copper present being not above 15%. There is no justification for continuing the adit, but ore may be found adjacent to the limestone on the east, and a crosscut might therefore be opened in that direction.

No. 2 adit was put in to test the northern limestone crop, but failed to find the bed.

OUTPUT.

Total ... 45 tons shipped, averaging 40% copper (*fide* Mr. McKeand).



ORE-BODIES.

Mr. McKeand, the prospector, states that the ore-bodies trenched made no crop, but that shoads of native copper and cuprite, from lumps the size of a potato up to 28 lb. in weight, were abundant on the surface. It is so long since any work was done here that little or nothing can be made out of the occurrence of the ore.

The country rock is schist with converging bands of quartzite, their lack of parallelism being probably due to folding of the strata.

The northern trench and shaft now show only a 6-in. seam of ore, dipping 2 in 1 to the east. The ore is said to have been 2 ft. wide in places. Small lumps of native copper, surrounded by concentric coatings of cuprite, can be picked out of the tip.

A little chrysocolla was noticed in the limonite thrown out of the hole to the south.

Much cuprite can also be found in the north-north-west-running trench, which, though diverging from the main line of workings, is parallel to many of the quartzite crops in this vicinity.

Little Wonder North (M.L. 259).

Mgr., Power.

LOCATION, ETC.

This adjoins the Little Wonder on the north.

Its area is 5 ac.

One small trench only has been opened on this lease, and that is 1 ch. from the north-eastern corner.

ORE-BODIES.

The trench is on the line worked in the No. 1 North. It exposes cupriferous gossan, worth further opening up, though probably a bunch.

Another small crop of gossan is to be seen in schist 2 ch. from the south-eastern corner. This is on the line worked in the Little Wonder.

Little Wonder North No. 1 (M.L. 260).

Mgr., Poole.

LOCATION, ETC.

This is separated from the Little Wonder by the North (M.L. 259). Its area is 10 ac.

DEVELOPMENT.

A line of holes extends along the whole of the eastern side of the lease. The northernmost hole (i.), which is 10 ft. deep, is in the gully 5 ch. from the northern boundary. A trench (ii.), 30 ft. long, is 2 ch. to the south, and a 10 ft. hole (iii.), now fallen in, lies 15 ft. further south. At 1 ch. beyond it is a trench (iv.), 50 ft. long, and ½ ch. south of it is a shallow trench (v.). Besides these there are three openings on the eastern boundary line. The central one (vi.), which is 1½ ch. long and 10 ft. deep in one part, is 1 ch. east of the 50 ft. trench (v.). At 1½ ch. to the north there is a shallow trench (vii.), and 1 ch. to the south is a trench 25 ft. in length (viii.).

OUTPUT.

4 tons shipped.
1906, ... 16 ,, ,, (McKeand).

The long trench (vi.) revealed irregular and ill-defined bodies of oxidised ore, of which 4 tons have been shipped.

A small bunch was found in the trench (vii.) to the north, and another occurred in that to the south, now showing only chloritic schist, with 9 in. width of siliceous gossan at the northern end.

Excelsior (M.L. 439).

Mgr., Power.

LOCATION, ETC.

The Excelsior is situated ½ mile east of the Little Wonder.

Its area is 10 ac.

Four costeans have been opened on this lease. One on the centre of the northern boundary is 20 ft. in length and 8 ft. deep; a second, 7 ch. to the south-south-east, has a hole in one end 20 ft. deep; a third, 50 ft. beyond, is 20 ft. long and 12 ft. deep near the centre; and the fourth, 1½ ch. on, is 20 ft. long and 5 ft. deep.

ORE-BODY.

This lease takes in a crop of limestone, ferruginous in parts, and showing occasional slight stains of copper, but unlikely to carry payable copper ore.

The first costean is in yellow, cherty, replaced limestone, beneath which a little copper may be found. The second costean is in limestone, with abundant dendritics but no sign of copper. The third is in white sinter (amorphous calcium carbonate) with some cherty jasper adjacent to the limestone, which here dips 3 in 1 to the east-north-east. Copper plant is abundant, but the mineral is present in only small quantities. The fourth costean is in rather gossany and sintery limestone, not worthy of further attention.

On the line of these crops, a few chains south-south-east of the lease, a blow of quartzite rises 70 ft. above the general level of the country.

Merrie Monarch (M.L. 378).

Mgr., McKeand.

LOCATION, ETC.

The Merrie Monarch is situated 2 miles north of the Mighty Atom, and really should be placed in a separate group.

Its area is 5 ac.

OUTPUT.

1906	16 tons bagged.
	4 ,, shipped.

ORE-BODY.

Mr. McKeand states that on this lease there is a formation similar to the Mighty Atom. It is 5 ft. wide, and can be traced for about 1½ ch. in a north-north-easterly direction.

JESSIE'S DREAM GROUP.

One lease only had been taken up here in 1906.

Jessie's Dream (397).

Mgr., Reid.

LOCATION, ETC.

The Jessie's Dream is just on the edge of the hilly country west of the Leichhardt River is 4 miles south-east by east of the Mighty Atom, and is 60 miles north-north-west of Cloncurry.

Its area is 5 ac.

Mr. McKeand informed me he had sunk a hole 15 ft.

OUTPUT.

3 tons shipped, carrying 45% copper.

ORE-BODY.

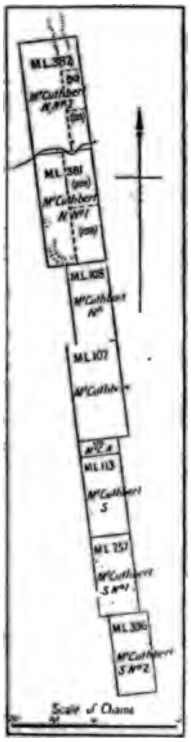
The outcrop is stated to be of siliceous ironstone. The pit is on a formation, 2 ft. 6 in. in width, carrying bunches of red oxide and native copper adjacent to the ironstone.

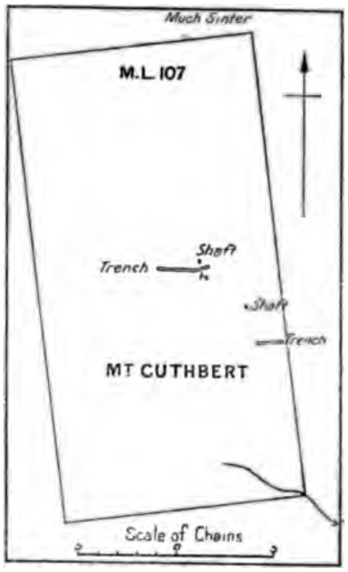
Mount Cuthbert (M.L. 107).

Mgr., Power.

LOCATION, ETC.

The Mount Cuthbert lease lies in the valley of one of the head branches of the Six-mile Creek, 19 miles south-west of Coolullah H.S., and 63 miles north-west from Cloncurry. A dray track connecting with the main Camooweal road at the Cabbage-tree mail change has now been open for some time.





The area is 30 ac.

DEVELOPMENT.*

An old hole (*a*), 10 ft. deep, lies near the eastern side, 10 ch. from the south-eastern corner; and, ½ ch. to the west-south-west, there is a trench (*b*), 10 ft. long and 4 ft. deep.

The main cutting† (*c*), 2½ ch. north-north-west of this, has a total length of 196 ft., the first section, 10 ft. deep, being 62 ft. long and running east-north-east and west-south-west, while the remainder, 5 ft. deep, runs east and west. Two holes have been sunk in the eastern arm, one (*d*) near the end being 7 ft. deep, the other, 26 ft. to the west, being 5 ft. deep.

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* From the manager's reports, published in the Press prior to 5th November, it is learnt that the new or main shaft has been sunk to a depth of 178 ft. in mineralised schist, and that 300 gall. of water per day at 106 ft. depth increased to 2,000 gall. per day at 145 ft. depth. Further a crosscut running 58 ft. east from the whip shaft at the 80-ft. level proves the following sections:—Eastern or hanging wall; 9 ft. ore; 4 ft. rock; 4 ft. ore; 2 ft. rock; 3 ft. ore; 3 ft. rock; 1 ft. ore; 6 ft. rock; 6 in. ore; 5 ft. rock; 1 ft. ore; 4 ft. 6 in. rock; 1 ft. ore; 1 ft. 6 in. rock; and 6 in. ore.

† Opened by the Chillagoe Option Co. 7 years ago.

The new whip shaft, which is 20 ft. north-north-west of the hole (*d*), was 85 ft. deep (water level?) when inspected, and cross-cuts had been opened for 40 ft. to the east, at the 40-ft. level, and for 40 ft. east-north-east and west-south-west at the 80-ft. level.

Eight men were working here on contract, but, unfortunately, the manager had business which prevented his being present at the time of my visit.

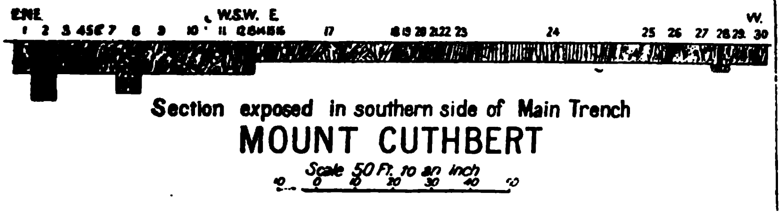
OUTPUT.

		15 tons	at grass, 20%.
		8 ,,	,, ,, 40%.
October, 1906	...	8* ,,	shipped.

* Possibly from the Kalkadoon.

ORE-BODIES.

The main costean exposes ferruginous chloritic schists, dipping 80° to the east-south-east, in which can be seen 10 main bodies of gossany ore from 6 in. to 6 ft. thick, besides which small bunches and leaders of ore are found in the schists in five places over widths of from 5 ft. to 12 ft., while in one place slate is stained and carries bunches of ore over a width of 36 ft. (See Section.) The exposed ore at first glance might be thought to be rich in copper, owing to a thin surface film of malachite produced by leaching and evaporation. No ore that could be considered payable, under present conditions, was seen in the trench, though part of the 8 tons of tile-ore and malachite native copper, and also bunches of tile-ore and malachite-stained kaolinised schist—the whole probably averaging 10% copper. In the western part of the bed of slate marked 24 cupriferous bands, 18 in. wide, are separated by barren rock. In the band of slate marked 20 copper, as malachite, amounts to 5%. There are 15 tons of 20% ore at grass from this costean.



Section exposed in southern side of Main Trench

MOUNT CUTHBERT

Scale 50 Ft. to an inch

REFERENCE.

1. 5 *ft. schist*
2. 3 *to* 5 *ft. gossany copper ore*
3. 5 *ft. schist with lenses of gossany ore*
4. 4 *ft. barren schist*
5. 1 *ft. formation*
6. 6 *to* 9 *in. ore*
7. 7 *ft. schists*
8. 6 *ft. gossan and formation*
9. 8 *ft. schist*
10. 7 *ft. kaolinised rk. veinid with ore and sinter*
11. 9 *ft. schist*
12. 6 *in. ore* (5%)
13. 3 *ft. schist with ore*
14. 6 *to* 9 *in. ore*
15. 6 *ft. schist*
16. 6 *in. gossan*
17. 30 *ft. schist*
18. 1 *ft. bunch cupriferous gossan*
19. 3 *ft. slate*
20. 5 *ft. slate with malachite* (5% *copper*)
21. 2 *ft. slate*
22. 6 *in. ore*
23. 12 *ft. slate*
24. 36 *ft. green stained kaolinised slate with bunches ore*
25. 12 *ft. schist*
26. 2 *ft. to* 9 *in. cupriferous gossan*
27. 12 *ft. schist with gossan leaders*
28. 9 *to* 18 *in. cupriferous gossan*
29. 6 *ft. schist with gossan leaders and bunches*
30. 6 *ft. schist.*

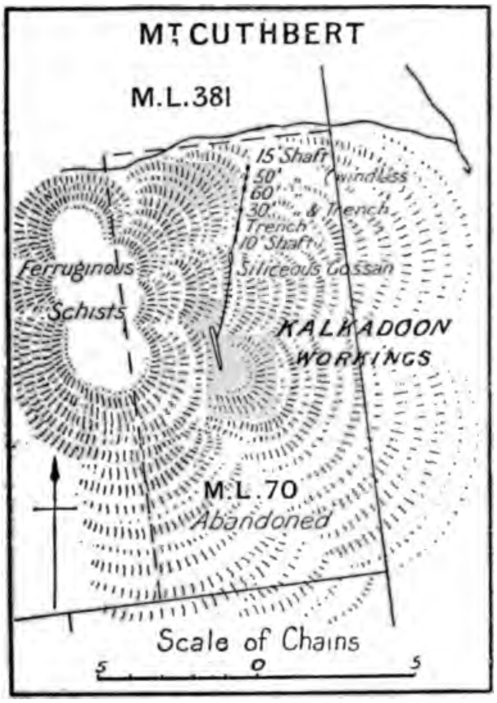
The presence of much copper-bearing limonite is evidence of the former existence of fairly dense chalcopyrite, during the oxidation of which much copper would be leached downwards. Prospecting by sinking on one of the ore-bodies and cross-cutting to test the others was therefore justifiable.

Some good ore was secured in sinking the main shaft, presumably from the band marked 16 in the section, the 40-ft. level crosscut being in 12 and 14. The crosscuts in the 80-ft. level were examined under difficulties, owing to the manager's absence, to the fact that the contractors were at work in it, and that the walls are plastered with mud. At the shaft bottom the bluish schists are slightly copper stained (surface band 16); 15 ft. west of the shaft is a 6-in. copper-bearing vein (one of the 18, 20, 22 group), and then barren schists; but 6 ft. east of the shaft is a 5-ft. band (12, 14 group) of rich carbonate ore (30%? copper), beyond which, however, there are only leaders, with, however, some black oxide or secondary sulphide (No. 8 in section) towards the face. About 8 tons of 40% ore at grass is reported to have come partly from the main shaft and partly from the long costean.

An interesting exposure of copper-stained gossan is to be seen in the old shaft (*a*) to the south-east of the above. The gossan varies from 3 ft. to 7 ft. in thickness, and has irregularly replaced schist. It contains 10% quartz and 10% schist, the remainder being dense and cellular limonite. Very little copper is showing, but it may be depended on to come in towards water level. On the surface the gossan seems to pinch out within 10 ft. to the south and within 15 ft. to the north, but the body should be prospected, as considerable enlargement may take place in depth (as at Cobar, where the country is very similar to this).

In the trench (*b*) only kaolinised schist with thin quartz veins can be seen, but between the trench and the shaft there is a crop of gossan.

Its area is 40 ac., includes forfeited M.L's. 70 and 109—the old Kalkadoon and Kalkadoon No. 1 North.



Development.[*]

The old Kalkadoon workings are at the northern end of the old lease. At 3 ch. from the north-eastern corner there is a shaft (*a*), 15 ft. deep. Then, 15 ft. to the south is the underlie windlass shaft (*b*), 50 ft. (?) deep and now inaccessible, from which a trench, 5 ft. deep, runs 12 ft. to the north. A further 50 ft. south of that is another inaccessible shaft (*c*), 60 ft. (?) deep, north and south of which ground seems to have been stoped out. Again, 40 ft. beyond is a 30-ft. shaft (*d*), with levels south for 20 ft., at 12 ft. from the surface, and north for 20 ft., at 15 ft. from the surface. At 15 ft. further south is a trench (*e*), 12 ft. long and 5 ft. deep; and 12 ft. to the south again is a 10-ft. pothole (*f*). No one was on the ground at the time of visit, and much difficulty was experienced in approaching the shafts, of which only one or two of the shallower ones could be descended.

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[*] The managers' reports published in the Press prior to 5th November, 1907, show that the No. 1 shaft at 50 ft. from the surface exposed 15 in. of massive glance, and at 61 ft. 12 in. to 18 in. of the same ore. No. 2 shaft at 85 ft. below the surface showed 18 in. of 25% ore, and at 100 ft. 6 in. of 20% ore. The southern drive from this shaft at the 75 ft. level proved 3 ft. of high-grade ore at 52 ft. from the shaft, 3 ft. of 15% to 20% ore and 2 ft. of 40% ore at 95 ft., 18 in. of 25% ore at 85 ft., and 6 ft. of 25% ore at 108 ft. from the shaft. In the western crosscut 43 ft. south of the shaft on the same level 10 ft. to 11 ft. of 10% ore was proved. The northern drive was in only 7 ft. on 4 ft. of gossan formation. The firsts at grass at the beginning of August amounted to 85 tons, and the seconds to over 100 tons.

OUTPUT.

1904	24	tons shipped (Kalkadoon).
1905	217	tons shipped (Mount Cuthbert).
1906	178$\frac{15}{20}$	tons shipped.
	200	tons bagged on the ground, believed to average 40% copper.*
	619$\frac{15}{20}$	

ORE-BODIES.

The ore-bodies occur as a succession of over-lapping lenses in a formation striking north 5° east and dipping steeply to the west. The ore bagged is reported to have been mostly glance and cuprite.

In the northern shaft (*a*) there is only 2 ft. of schist formation at the surface, and that appears to be pinching at the bottom.

The underlie shaft (*b*) shows little because of the timbering. It dips 5 in 1 to the west. Only about 5 tons of seconds (gossan and stained country) carrying 5% copper are at grass.

The shaft (*c*) also underlies, and is flatter towards the bottom. There is probably 3% copper in the tip at this shaft. The 8 tons of ore, at grass ready for sorting, consists of a mixture of gossan and malachite, limonite, with disseminated cuprite and quartz (original and drusy in cavities), chalcopyrite, pyrite (mosaic in limonite), and over a width of 18 in. of quartz-veined schist. The chlorite schist here is slickensided internally, west of the lode, for 2 ft. as above, but the eastern country is more gritty and less altered, though copper-stained for 12 in. from the lode. This shaft should be continued, as there is a possibility of a large ore-body being struck here. The ore at the brace is very siliceous, being really a quartz breccia, cemented by limonite, with secondary silica in cavities and with strong stains of manganese dioxide, as well as malachite and chrysocolla; there is also some green-stained kaolinised schist. Much 10% ore could be culled from the tip, and 40 tons is bagged at grass, the "seconds" (quartz-bearing limonite) amounting to 25 tons, probably carrying 10% copper.

Only a few inches of ore are showing at the northern end of the trench (*e*), but there is 12 in. at the southern end. The ore here includes small angular quartz fragments cemented by quartz-bearing limonite (some of it stained by chrysocolla) and with malachite in open spaces.

The shaft (*f*) is being sunk alongside 6 to 18 in. siliceous limonite, in malachite-stained kaolin.

The siliceous gossan, containing some copper, widens out south of the last hole, being 20 ft. across ½ ch. distant from it, where it unites with or runs for a chain alongside an 18-ft. blow of silicified limonite or yellow jasper. The boulders, over a further width of 20 ft. east of the blow, have probably fallen from the crop.

The large blow, which is distinctly banded and contains white quartz, crops for ½ ch. to the north-north-west of the junction.

Mount Cuthbert 1 South (M.L. 257).

Location, Etc.

This adjoins M.L. 113 on the south.

Its area is 20 ac.

The workings comprise a 35-ft. shaft (*a*), in about the centre of the lease, and now inaccessible; a trench (*b*), 1½ ch. to the north; and trenches and holes to the south. This work was done by tributors during 1905.

Output.

40 tons, yielding 20 to 35% copper.

Ore-bodies.

A siliceous limonite crop runs south from the northern trench to the main shaft, in which 3 ft. of gossan can be seen going down vertically. The ore now at grass, amounting to ½ ton, consists of siliceous gossan, with chalcopyrite altering into glance—copper 5%—but some 40 tons are said to have been shipped for yields of from 20% to 35% copper.

A 6-in. siliceous gossan leader on an east and west joint has been trenched for 2 ch. from the shaft, and lead to the discovery of a small bunch of ore.

The ore-body seems to have pitched to the south at the shaft, for it was not found in the southern trenches and holes.

Mount Cuthbert No. 2 South (M.L. 396).

Location, Etc.

Adjoining M.L. 257 on the south.

Its area is 20 ac.

The one shaft, 25 ft. deep, near the northern boundary, was sunk early in 1906.

Ore-body.

The shaft is sunk in kaolinised schist, with abundant sintery magnesite and scattered masses of ore, consisting of kaolinised schist with quartz, limonite, malachite, and chrysocolla, exhibiting small quantities of the original pyrite. The copper content of the 3 tons at grass probably does not exceed 5%.

COOLULLAH.

The Coolullah district includes those holdings to the west of the station of that name, on the Leichhardt River, lying north of the Leichhardt River groups. These mines are all included within the catchment areas of Copper Mine and St. Paul's Creeks, a region of old land forms, approaching the peneplain stage.

WARWICK CASTLE GROUP.

The group lies about 3 miles south-west of Von Bremen's camp, on the head waters of St. Paul's Creek, 69 miles north-west of Cloncurry.

The ore-bodies are overlapping lenses of quartzite on a north-north-west line, and traceable for 1½ mile from the Castle to St. Paul's Creek. Beyond the creek the crops trend northwards, and run 1½ mile to the west of Von Bremen's Camp. The quartzite is broken and the schists are crushed in a similar manner to those at Duck Creek.

The timber is as usual thin and stunted box and bloodwood.

The Warwick Castle No. 1 North (M.L. 645), No. 2 North (M.L. 646), No. 3 North (M.L. 643), and the Evelyn (M.L. 644) are here omitted as not yet worked.

Warwick Castle (M.L. 314).

LOCATION, ETC.

The Warwick Castle is at the head of St. Paul's Creek, 6 miles north-north-west from Mount Cuthbert, and 12 miles south-west from the Dobbyn.

Its area is 20 ac.

There were no workings at the time of my visit.

ORE-BODY.

The main crop is formed of green-stained, quartz-veined, schistose quartzite, a chain in length, 12 ft. in width and rising 20 ft. above the general slope of the ridge. The quartzite can be traced for 10 ch. south-south-east of the main "castle" and for 5 ch. to the north-north-west, where it forms a second but smaller blow. It is granular in parts, but much of it has the appearance of crystalline quartz. It has in some places been shattered and crushed and is then ferruginous, and on the whole is similar to the Tharsis and Chinaman crops at Duck Creek. No payable ore is in sight, but one or two small bunches of cellular malachite-bearing tile-ore were seen. It is therefore unlikely that, if sunk upon, the ore will average over 5% copper even after the rejection of 50% quartz. The country is schistose slate, with quartz lenses plentifully developed near the quartzite.

Kenilworth (Extended M.C. ?).

Location, Etc.

The Kenilworth is ½ mile north-east from M.L. 314, and about 10 ch. east of the Warwick Castle line.

This is four men's ground—taken up as a block on the Warwick Castle line, for which there is no present justification.

One pothole has been sunk.

Ore-body.

In the pothole there is 6 in. to 2 ft. of quartz and gossan with some chalcopyrite, altering to glance, and also malachite but very siliceous. This is probably a bunch less than a chain in length.

The country rock is slaty schist.

Louisa (M.L. 643).

Location, Etc.

The Louisa is on the northern side of the head of St. Paul's Creek, 1½ mile from the Warwick Castle.

Its area is 10 ac.

Only surface scratching has yet been done, the ground having been just pegged out.

Ore-bodies.

Small patches of gossany ore are scattered over the surface with earthy calcareous sinter and quartz, the country rock being ferruginous schist.

Isabella (M.C. 360).

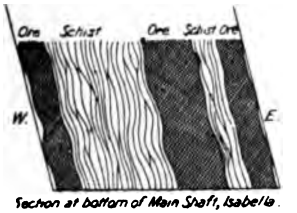
Location, Etc.

The Isabella, originally P.A. 257, is ½ mile west of Von Bremen's camp on St. Paul's Creek, 71 miles north-west-by-north of Cloncurry.

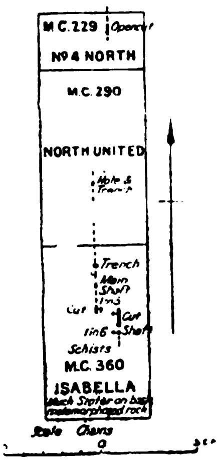
Its area is 600 ft. × 350 ft.

Development.

The workings consist of, on the western lode, a trench (*a*), 1 ch. from the northern boundary, a main shaft (*b*), 45 ft. deep, a chain to the south, and a cut (*c*), a chain further south: on the eastern lode a cut (*d*), 60 ft. long × 10 to 12 ft. deep, 1 ch. east of the cut (*c*), and a shaft (*e*), 25 ft. deep, 15 ft. to the south.



Section at bottom of Main Shaft, Isabella.



Output.

	14 tons shipped		25 to 26½%
	(15 ,,	at grass)	
1906 ...	9 ,,	shipped.	

Ore-bodies.

The two ore-bodies, worked on this claim, were most likely formed in shear-zones by uprising solutions. They are parallel, one chain apart, and dip towards one another at steep angles.

In the northern trench, on the western lode, 2 ft. 3 in. gossany carbonate ore, with at least 10% copper, is exposed in the northern end, but there is only formation at the south end. The cap of the lode, averaging 9 in. in thickness, has, however, been traced southwards to the main shaft.

The main shaft shows no defined lode, but an internally slickensided schist formation, dipping 1 in 3 to the east, and similar to those at Duck Creek, in which lie bodies of ore. The chloritic schist country is greatly crushed near the formation, and all faces are brightly slickensided. This is indicative of extensive shearing, and there is consequently considerable promise of the ore formation being permanent.

Most of the ore consists of chalcopyrite, altering throughout into limonite and glance, with some patches of ferruginous tile-ore and a little malachite. The 4 tons of ore at grass, secured from the last 15 ft. of sinking, may be expected to yield 40% copper. The cellular nature of some of the surface ore signifies that at water-level chalcopyrite is to be expected.

Sinking is, therefore, to be continued, and further prospecting should be carried out by cross-cutting.

In the southern cut (*c*) the schist, over a width of 3 ft., is slightly cupriferous and 2 cwt. of siliceous limonite, carrying 10%, copper, has been paddocked.

The cut (*d*), on the eastern lode, shows that the ore is in the form of a succession of lenses, up to 12 in. thick, dipping 1 in 6 to the west. The ore shipped, 2½ tons, yielded 26% copper; and the 8½ tons (chalcopyrite and limonite with interlacing malachite) lying at grass, probably carries 30% copper.

The eastern shaft (*c*) is also sunk in a schist formation, the width of the shaft, with bunches of quartz and poor ore. The formation can be traced for a chain to the south.

The immediate country rock is a crushed chloritic schist, but to the south-east is basic igneous, highly metamorphosed but not schistose.

Isabella No. 4 North (M.C. 229).

LOCATION, ETC.

This adjoins M.C. 290 on the north.

Its area is 200 ft. × 350 ft.

There is one opencut 25 ft. long and 15 ft. deep.

OUTPUT.

8 tons shipped, 32%
4 ,, at grass, 30% (?)

ORE-BODY.

The opencut is on the line of strike of the eastern body found in the Isabella. The crop, which extends due north for 2 ch. north of the cut, is made up chiefly of iron-stained quartz. The schist formation, which in the northern end of the cut is 9 in. to 2 ft. wide, carries bunches of quartz, chalcopyrite, and secondary oxides and sulphides, stained by malachite. Of the ore raised 3 tons of "firsts" from which all quartz has been separated and which is expected to carry 30% copper, remain at grass. The "seconds" at the brace amounting to 2 tons may carry 20% copper with considerable silica.

The ore-body is in a belt of ferruginous schist, in which other lenticular bodies are to be counted on.

Mount Hare (M.L. 642).

LOCATION, ETC.

Mount Hare lies 1½ mile north-north-west of the Warwick Castle, and 2 miles west-north-west of Bremer's Camp on St. Paul's Creek.

Its area is 10 acres.

No work has yet been done, and the lease was not visited.

ORE-BODY.

It is reported that the crop consists of quartzite, stained green by carbonate of copper.

Hare's Excelsior (M.L. ?).

LOCATION, ETC.

Hare's Excelsior lies 1 mile south-west of his camp, on Hare's Creek, one of the upper branches of St. Paul's Creek, about midway between the Dobbyn freeholds and Warwick Castle leases.

One shaft (*a*) 8 ft. deep, a pothole (*b*) 20 ft. to the west, and a trench (*c*) 30 ft. to the north of the latter are all the workings. No work was going on at time of visit, but it was proposed shortly to let a tribute to two men.

ORE-BODIES.

The shaft was opened in gossany quartz at the surface, overlying 3 ft. of sintery formation, below which is an 18-in. vertical quartz reef, striking east and west. It carries, say, 10% of limonite with strong copper stains.

One or two lumps of ore seen exhibit original chalcopyrite, in process of oxidation into glance and limonite.

The country rock, a dark gritty slate striking north and south, is crushed for 6 in. from the lode, and contains quartz leaders.

The pothole (*b*) is on the same reef, here apparently contracting in depth and containing no visible pay ore, but worth prospecting.

The northern pothole (*c*) may possibly be on a faulted portion of the same lode. It reveals only 6 in. of quartz, but granular calcite occurs in the crop a few feet to the west.

A parallel crop of gossany quartz occurs 1 ch. east-south-east of the main shaft, and the schists, 2 ch. beyond, are stained with copper.

Generally speaking, there is very little to be seen here, but some work might be carried out in search of copper ore beneath the more gossany crops.

Mount Stanley (M.L. 584).

LOCATION, ETC.

Mount Stanley is 2 miles west-north-west from Von Bremen's Camp, at the head of St. Paul's Creek.

Its area is 20 ac. The lease was not visited.

One shaft has been sunk 8 ft.

There are reported to be three lodes.*

Violet United (M.C. 317).

LOCATION, ETC.

The Violet United is 1 mile south-east of Hare's camp on Hare's Creek, one of the upper branches of St. Paul's Creek.

Several small masses of ore, of no continuation and known to the miners as "squibs," occur in the western part of the claim and there are some leaders near the centre, on which it is proposed to sink a shaft.

There is nothing here to warrant further work.

Mount Brown (M.L. 652).

LOCATION, ETC.

Mount Brown is 1 mile south-east of Hare's camp, upper St. Paul's Creek.

Its area is 5 ac.

No work has yet been done.

ORE-BODIES.

No body has been exposed, though the silicified country, proved cupriferous in the No. 1 North, continues through this lease. The silicified and crushed quartzites are here 30 ft. wide, but contain only stains of copper ore.

Mount Brown No. 1 North (M.L. 653).

LOCATION, ETC.

This adjoins M.L. 652 on the north-north-west and the Violet on the south-east.

Its area is 5 ac.

There are no workings.

ORE-BODIES.

The ore-bodies occur in a ferruginous and siliceous belt of altered sediments, adjacent to an intrusive mass of granite. Nothing payable or even worth prospecting has yet been proved here, but the occurrence is full of significance geologically.

A crop of silicified limonite, 30 ft. long and 10 ft. wide, occurs on the southern side of the knoll of silicificous slates in the centre of this lease. It carries stains of copper, which metal may have been introduced after the intrusion of the granite.

Mount Brown No. 1 South (M.L. 654).

LOCATION, ETC.

This adjoins M.L. 652 on the south-south-east.

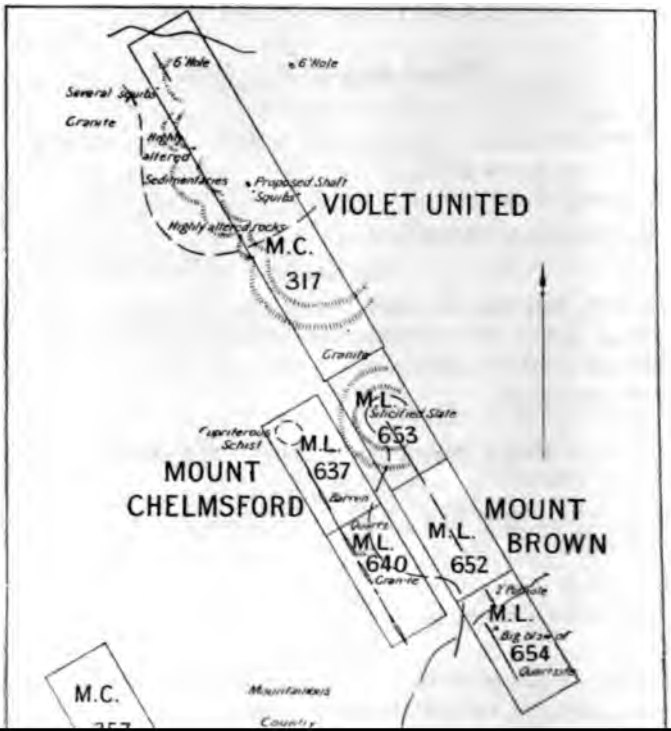
Its area is 5 ac.

One pothole, 2 ft. deep, is near the boundary of M.L. 652.

ORE-BODIES.

Blocks of limonite, with original chalcopyrite altering into glance and containing some tile ore, have been taken from the pothole, some feet east of the line of strike of the Mount Brown siliceous crop, but no lode is exposed.

Across the creek to the south is a big blow of white quartzite, probably a continuation of the Mount Brown crop. This, it is reported, can be followed for several miles to the south.



There is one hole, 12 ft. deep.

This claim is reported to be in similar country to that at the Violet, striking north-west and south-east.

Mount Chelmsford (M.L. 637).

Location, Etc.

Mount Chelmsford is to the west-south-west of, and separated by one chain from, M.L. 653.

Its area is 5 ac.

No work has been done.

Ore-bodies.

The ore-bodies comprise blows of quartzite, forming a line parallel to the Mount Brown crop. The quartzite has been shattered in one or two places, and has there been rendered cupriferous to a very slight extent. It was at first thought that these blows of quartzite indicated eruptive after effects of the cooling granitic magma, but the discovery of a few patches of schist in connection with them proves conclusively that they are older than the igneous rock, which has been able to almost completely absorb the comparatively basic schists, leaving the quartzites untouched. The small quantities of copper ores, in schist and quartzite, may, however, have been given off pneumatically from the granite.

The blows of pink quartzite are several feet thick, but contain copper ore in only one or two places, where shattered. At the northern end of the lease there is a small area of dark, schistose, somewhat siliceous, slaty rock, an inclusion of the sedimentaries in granite. A little copper occurs in the more schistose parts, the quartz, gossan, and crushed rock, on the north-western boundary of the lease, averaging between 3 ft. and 6 ft. This is the only part of the crop worth trenching even.

Mount Chelmsford No. 1 South (M.C. 294).

Location, Etc.

This adjoins M.L. 637 on the south-east.

Its area is 400 ft. × 350 ft.

There are no workings.

Ore-bodies.

Blows of pink quartzite occur here in granite, but very little copper ore can be seen, and that only where the quartzite is shattered.

Emerald No. 1 South (M.C. 358).

Location, Etc.

The Emerald claims have been taken up on a line parallel to the Mount Chelmsford and ¼ mile to the south-west.

The area of the No. 1 South is 600 ft. × 350 ft.

A pothole 4 ft. deep is on the south-eastern boundary.

ORE-BODIES.

The ore-bodies in the Emerald claims occur both in schist and granite. They would appear to have been formed in the schist, and now occur partly in the granite, owing to the absorption of the original country rock by the molten intrusive magma, as at Mount Chelmsford. They are of little economic value, but of considerable geological interest.

In the northern portion of the No. 1 South quartz occurs in a schist belt a chain wide, presumably near the base of a trough, for there is granite on both sides.

At the southern end of the claim quartz and gossan, 3 ft. wide, dips 80° westwards in granite, into which pass numerous leaders and droppers from the lode. A few hundredweight of copper ore (limonite with chalcopyrite and secondary sulphides) have been paddocked. Nothing payable has yet been proved here, though traces of lode material have been found over the whole length of the three claims.

Mount Cherry (M.C. 362).

LOCATION, ETC.

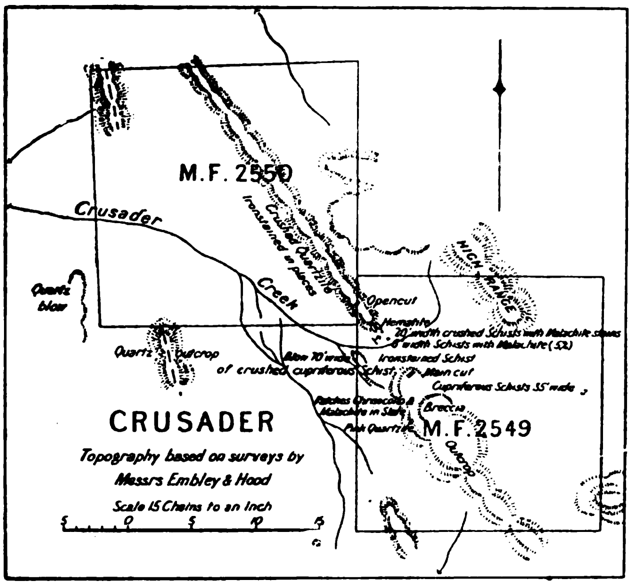
Mount Cherry is 6 ch. south-west of the Emerald.

Its area is 600 ft. × 350 ft.

One pothole has been sunk 3 ft. in the centre of the claim.

ORE-BODIES.

The ore, of which only a few hundredweight have been paddocked, From any eminence a number of quartzite crops can be seen in this locality, most of the ridges being, in fact, due to them. Their divergence in strike is particularly noticeable and this irregularity is probably due to contortion of the strata and does not indicate that the quartzites make the sites of fissures.


M.F. 2550
M.F. 2549
Crusader Creek
Crushed Quartzite
Ironstained in places
Quartz blow
Quartz outcrop
Opencut
Hematite
20' width crushed Schists with Malachite stains
8' width Schists with Malachite (52)
Ironstained Schist
Blow 70' wide of crushed cupriferous Schist
Main cut
Cupriferous Schists 35' wide
Patches Chrysocolla & Malachite in Slate
Pink Quartzite
Breccia
Outcrop
HIGH RANGE
CRUSADER
Topography based on surveys by Messrs Embley & Hood
Scale 15 Chains to an Inch
5
0
5
10
15

LITERATURE.

(2) Mr. Jack reported thus:

> A mile further, the *Crusader Copper Lode* (12 miles from Walsh's camp) stands up boldly above the surrounding country. Its matrix is quartz, which can be seen from a distance to be stained green with copper ore. The lode runs north 40 degrees west and is about 50 feet wide. On the surface and sides are large masses of copper ore and gossan. I broke out some fair samples of red oxide, malachite, and grey ore. The ore is more intimately mixed with silica than is usual in this district. A cutting has been driven into the N.E. side of the lode for a distance of about 15 feet. Besides copper ore, the cutting shows a large quantity of specular iron in a matrix of pale green talc. The association, in the same lode, of copper ore and ironstone, is suggestive, considering the number of enormous outcrops of ironstone which occur in the district.

(7) Mr. Rutherford says of the Crusader:

> The freehold includes the northern end of a prominent quartzite range, which runs in a north and south direction over a large extent of country. The quartzite is iron-stained and associated with quartz, and shows patches stained green with copper salts. A cutting 25′ into the west side of the hill shows talc schist impregnated with iron and associated with copper carbonate. Some good bits of red oxide can be picked out of the mullock heap on the surface, but no body of ore could be seen in the trench and the stained ground could not be traced on the surface farther than a few feet. Following the quartzite to the north, across a small creek, about 100 yards, a second trench shows iron-stained slate, showing a few copper stains. Beyond this the quartzite continues hard and barren.

Crusader (M.F. 2549).

LOCATION, ETC.

This freehold is located at the head of Crusader Creek, a branch of Soda Creek, which empties into Coppermine Creek, a tributary of the Leichhardt River.

The area of the block is 40 acres approximately. It was taken up under the old 1874 Mining Act as a mineral selection, and became freehold by the observance of the conditions.

DEVELOPMENT.

The northern cut is on the crest of the ridge, just on the boundary of M.F. 2550. It is 18 ft. long, and in the north-eastern end there is a pothole 8 ft. deep.

The southern cut, on the north-eastern side of the ridge, 9 ch. south-east of the north-western corner, is 20 ft. long, and at the south-western end is 8 ft. deep.

ORE-BODIES.

Barren quartzite forms the greater part of the crop in the south of M.F. 2549, but in the north-western part of the block the quartzite gives out to a great extent, and the schists there are impregnated and stained over considerable widths by malachite.

The northern cut exposes only silicified country veined with limonite, and the hillock to the north-north-west is built of crushed quartzite, iron-stained in places. A thin vein of carbonate ore has lately been brought to light in shallow potholes just to the south of the trench.

Two chains south-east of the northern cut the schistose country cut proves the schists to have been almost completely sericitised, with the development of plumose aggregates of sericite plates. Crystallised and granular hæmatite and magnetite (both strongly magnetic), introduced subsequently to the sericitisation of the rock, are very abundant and cellular limonite casts of original pyrite are also plentiful. The whole face of the cut is stained green, but only on the exterior, and there are a few bunches of fair grade (20%) earthy carbonate. My sample (38/B), taken from 16 ft. width on the south-eastern side of the cut, was examined at leisure, and found to consist of completely decomposed schist, stained a faint green by silicate and carbonate of copper. Some of the schist is cellular and iron-stained, owing to leaching out of pyrite. Only one small fragment of rich malachite and glance ore was included, and this showed a little native copper. The following is the result of analysis (Government Analyst):—

Gold ... ... = nil
Silver ... ... = nil
Copper ... ... = 5·3%

The ore from the cut was stacked alongside it, but the heap has evidently been picked over, and only the poorer material, amounting to 3 tons, now remains. Crystalline radiating malachite occurs here in plumose sericite (?), and the ore contains 10% copper and 50% iron.

About 2 ch. south of this trench the crop is formed of a breccia of quartz, cemented by silicified limonite, the whole gradually passing first into cellular gossany quartz and then into pink quartzite, within 5 ch. of the cut. It would be worth while opening an adit on the north-eastern side of the gossany quartz crop and 40 ft. below the cap.

Some small cupriferous areas were noticed 2 ch. south-west of this portion of the main crop—the copper occurring as silicate and carbonate encrusting the sides of cracks in the siliceous slate country.

Crusader (M.F. 2550).

Location, Etc.

This adjoins M.F. 2549 on the north-western corner.

Its area is 40 ac.

Ore-bodies.

Little copper was seen on the northern freehold though the crushed quartzites traverse it as a bold ridge and continue for nearly a mile.

The cupriferous country exposed in the northern trench on M.F. 2549 must at least enter this. However, only a few chains to the north-west, crushed quartzites occupy the whole of the ridge, and preclude any likelihood of extensive ore-bodies being found on it.

Mount Leonard (M.L. 563).

Location, Etc.

Mount Leonard is ¼ mile west of M.F. 2549.

Its area is 20 ac.

No work has been done.

ORE-BODY.

There is here a north-and-south striking band of quartzite, 2 ft. to 10 ft. in width. It is generally iron-stained, and in parts has the structure of a crush zone.

Orphan (M.L. 667).

LOCATION, ETC.

The Orphan is one mile due east of Alchin's Camp, which is a mile east of the Dobbyn freehold.

Its area is 10 acres.

One pothole has been sunk at the end of the ridge in the southern part of the lease.

ORE-BODIES.

In present state of development it is impossible to generalise as to the nature of the ore-body, beyond stating that the crop is similar to the Chinaman, and may be part of a crush-zone. In about the centre of the lease there is a north-north-west striking quartzite crop of the Chinaman type, but rather more gossany than the original at Duck Creek. The width is 12 ft. and the total length of crop is 6½ chains, of which 1½ ch. at the northern end is very gossany and worth testing for low grade copper ores. The more barren part of the crop forms a low ridge, beyond which gossan and quartz rubble on the surface have induced prospecting, with the result that a ½ ton bunch of ore was located in a shallow hole. The ore, as bagged, consists of rather impure malachite with a little glance, the copper amounting to between 20 and 25%. It could however be picked much cleaner than this, with little trouble. The seconds at grass are very high in silica but should yield 5% copper.

Flower (M.C. ?).

Location, Etc.

The Flower is 1 mile south-south-west of the Crusader.

The trench opened is 20 ft. long, 6 ft. wide, and up to 12 ft. deep—and is now partly filled in.

Ore-body.

The crop is composed of quartzite, dipping 1 in 10 vertical to the north 25° east. In the trench 18 in. of gossany quartz is visible. Of the ore raised 1 ton has been bagged, and 1 ton lies unpicked at the surface. The latter is chiefly granular limonite, with only stains of carbonates on the joints, and containing not much more than 2% copper. The bagged ore is much richer in malachite (as acicular crystals in tile-ore) the copper reaching 20%, but it is very siliceous.

Porphyry occurs in the vicinity.

Clinker (M.L. 565).

Location, Etc.

The Clinker lies ¼ mile south of M.F. 2550.

Its area is 20 ac.

There is one trench, 6 ft. long.

Ore-bodies.

This lease is traversed in a direction east 10° south by a crop of quartzite, showing bunches of fairly rich carbonates in places.

In the trench there is 2 ft. of quartz-bearing limonite on the foot-wall adjacent to 4 ft. barren white quartz. The gossan extends on the surface, for a distance of 1½ ch., and may be confidently expected to carry bunches of carbonates beneath the surface.

Other quartzite crops in this vicinity are not parallel to the above, and their divergence is to be explained by folding of the strata in which they occur.

Mount Sparklet (M.L. 564).

Location, Etc.

Mount Sparklet is ½ mile south-east of M.F. 2550.

Its area is 29 ac.

No work has been done here.

Ore-bodies.

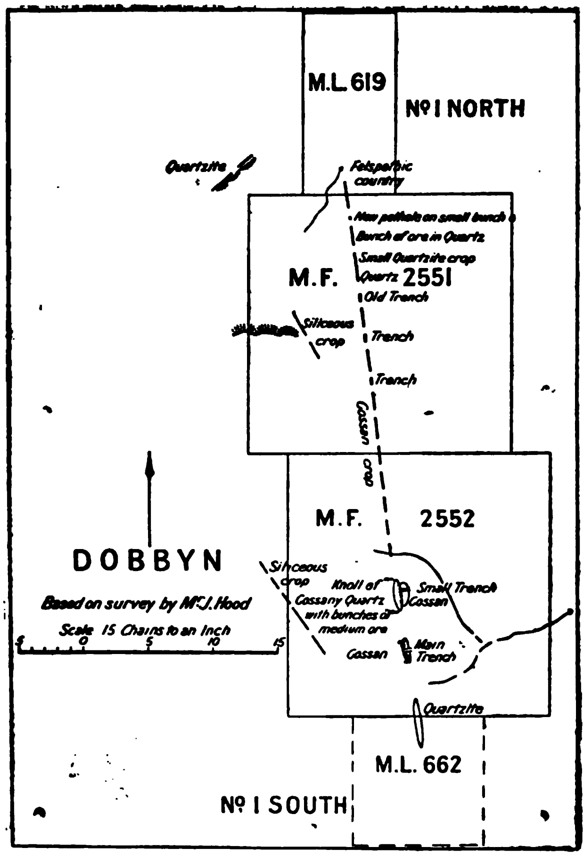
The main quartzite crops lie on a line striking east 10° north. They are from ½ to 1 ch. in length and separated by blanks of from ¼ to 1 ch., in which no crop is to be seen. The separate crops are up to 8 ft. in width, and some of them stand 10 ft. above the ground, the rather ferruginous over widths of 2 ft., and, where crushed or schistose, general effect being that of a ruined wall. The quartzite is in parts

[illegible] [L. C. B. [illegible]

[illegible] ft. long and 2 ft. wide. [illegible] ferruginous, and [illegible] silica along crush- [illegible]

The country rock in the immediate vicinity of the ore-bodies is quartzite and schist, but a considerable development of schistose porphyry was noticed in the northern part of M.F. 2551.

Insufficient work has been done on the ore-bodies for it to be definitely decided as to what their nature is.



LITERATURE.

(2) Mr. Jack's visit was a hurried one, but he was able to note that "the lode is about 15 ft. wide and shows a promising gossan of green carbonate of copper mixed up with quartz."

(7) Mr. Rutherford's account of the Dobbyn is as follows:—

> The surface shows small "blows" of iron-stained quartz and quartzite, some of which are copper-stained. An irregular hole 20′ across and 10′ deep shows siliceous schist stained with carbonate. Mr. Henry informs me that he sent away 10 tons of rich ore picked up as loose boulders from the surface. I could see no indications of ore on this property, and consider it of little value.

Dobbyn (M.F. 2551).

LOCATION, ETC.

This is the northern of the two leases. It lies a mile west of Copper-mine Creek, at a point 10 miles above the Leichhardt River.

The block is 20 ch. square and contains 40 ac.

The work done consists of several old trenches, located at intervals of a few chains along the outcrop. Near the northern boundary miners, in ignorance of the ground being freehold, lately sunk a hole 8 ft. (*a*).

ORE-BODIES.

The new hole (*a*) on the northern boundary has been sunk on iron-stained and gossany quartz. About 6 tons of very siliceous malachite-bearing limonite is still at grass. This may carry 15% copper.

Southwards there is no crop to speak of, the ore presumably occurring as bunches in a crush zone whose general trend is indicated by the fragments of gossan and quartz on the surface. Little can now be seen in the shallow trenches opened many years ago to prove the lode.

Dobbyn (M.F. 2552).

LOCATION, ETC.

This adjoins M.F. 2552 on the south.

Its area is 40 acres.

The main cut, only 5 ch. from the southern boundary, is 20 ft.

Dobbyn No. 1 South (M.L. 662).

Mgr., Sweeney.

LOCATION, ETC.

This adjoins M.F. 2552 on the south.

Its area is 10 acres.

A few potholes have been opened.

ORE-BODIES.

The ore-bodies are bunches, up to 15 in. wide, in schist, dipping very steeply to the east. These are located on a line, which, if continued, would run about a chain west of the Dobbyn main line of workings and crops.

Much of the ore is high grade glance, some of it mixed with malachite, and generally free from quartz. From one pothole 1 ton of pure glance was taken, and from a cut 3 tons of glance-malachite ore, probably averaging 30% copper, was secured.

Some dense, high grade, glance ore has been found here—free from other minerals than limonite and malachite, the former as minute specks evenly distributed through the mass, the latter as very thin veinlets. In addition a few grains of chalcopyrite, yet unoxidised, can be seen. Another quality of ore is the cavernous amorphous malachite, in the less open portions of which some glance occurs, indicating that the malachite has been produced from its oxidation.

Dobbyn No. 1 North (M.L. 679).

LOCATION, ETC.

This adjoins M.F. 2551 on the north.

Its area is 10 acres.

The one pothole, 5 ft. deep, is 2 ch. from the southern boundary.

ORE-BODY.

The pothole has been opened in the ferruginous quartz, representing the continuation of the Dobbyn crop, which is traceable for ½ ch. to the north. It exposes 3 ft. width of quartz, with malachite pinching to 18 in. at the bottom, owing to the eastern wall dipping westwards, while the western wall is nearly vertical. The ore is very siliceous, but also contains much iron, and rich bunches of ore will probably be found if sinking and driving are carried out.

The immediate country rock is schist, but schistose porphyry forms considerable crops in the vicinity.

Bauhinia (M.C. 347).

LOCATION, ETC.

The Bauhinia lies about ½ mile north of the No. 1 Dobbyn.

Two men's ground, 350 ft. x 400 ft., is here included.

One hole, 3 ft. deep, has been opened.

ORE-BODY.

The crop is quartz, striking nearly north-east. From the hole, which was full of water at time of visit, 7 bags (5 cwt.) of ore have been taken. This consists of limonite with disseminations and veins of malachite, a fair amount of granular quartz, some glance, and traces of the original chalcopyrite. It may be expected to yield 25% copper.

The only rock crops in the vicinity are of porphyry.

Widow (M.C.).

LOCATION, ETC.

The Widow is on the western bank of Soda Creek, 2 miles east of the Dobbyn freeholds.

It is one man's ground—350 ft. × 200 ft.

There is one hole, 5 ft. deep.

ORE-BODY.

This appears to be a bunch of ore, not more than 10 ft. in length (east and west) and 18 in. wide, for though iron-stained quartz is to be seen on the surface, both east and west of the hole, the fragments have been shed from separate bodies.

The copper ore of which about 20 bags (¾ ton) have been separated consists of crystalline cuprite, surrounded by malachite-bearing kaolin.

The country rock, felspar porphyry, is not sharply defined from the ore-body, and is kaolinised to the north-east of the hole.

ORE-BODIES.

In the northern hole bunches of ore occur over a width of 3 ft., but, as it had lately been flooded, the exposure was not very distinct. About 5 tons of ore have been stacked. This consists of dense limonite, with disseminated radiating malachite and granules of quartz, and probably carries 10% copper, with 20% silica. This body is well worth sinking on.

For ½ ch. to the south 30° east of this hole the gossan has been silicified, but beyond that to the southern hole it carries little silica. The lode in the southern hole descends vertically and is only 12 in. wide. At the surface it is cellular, but beneath is more dense, and carries one-third malachite and chrysocolla, with say 20% silica. This also is worth sinking on, though the crop can be followed for only 6 ft. further southwards.

Nil Desperandum (M.C. 343).

Mgr., Wilmot.

LOCATION, ETC.

The Nil Desperandum is 1½ mile west of Coppermine Creek and 1 mile north of the Dobbyn freehold.

Its area is 400 ft. x 350 ft.—two men's ground, previously held as P.A. 289.

Four potholes have been sunk along and adjacent to the line.

OUTPUT.

2 tons shipped, 23½% copper (Alchin).

ORE-BODY.

A north-and-south crop of gossany quartz, with bunches of carbonate and oxide of copper, occurs in schists, dipping steeply to the east. The total length of crop is 3 chains, and holes have been sunk only where copper showed on the surface, leaving the most promising—the northern part—of the crop untouched.

Wilmot's (M.C.).

LOCATION, ETC.

Wilmot's is ¼ mile south of the Glenferrie.

One shallow trench has been opened.

ORE-BODY.

The ore is quartz, with limonite on joints, and carries chalcopyrite partly oxidised to limonite and glance. Of the copper ore (30% copper) about 1 cwt. has been stacked.

Glenferrie (P.A. 300)

Mgr., Wilmot.

LOCATION, ETC.

The Glenferrie is near Old Man Creek, 3 miles south of the Boundary.

Its area is 10 acres.

Two potholes have been opened, 1½ ch. apart.

ORE-BODY.

The work done does not allow of the size of the ore-body being determined for certain, but it is probably between 2 and 3 ft. wide. The northern portion of the crop consists of quartz, but at the workings it is chiefly calcite.

At the northern pothole there are a few hundredweights of dense earthy malachite and limonite, and fibrous radiating malachite ore (mammillary and stalactitic in cavities), containing some quartz, but capable of being hand-picked up to 40%. Further work should be done here.

At the southern pothole the ore consists chiefly of ferro-calcite with chalcopyrite and interstitial limonite and glance. It would be difficult to concentrate this ore by hand above 10 or 15% copper.

The country rock just to the east of the lode, which strikes north-north-west, is the porphyry, but diorite occurs on the road a few chains to the west.

Flaneur (M.L. 655).

Mgr., Alchin.

Ore-bodies.

Two distinct lines of crop, a chain apart, have been found on this property. There is no special sign of permanence in these lodes, except the fact that they crop for several chains on the surface.

In the shaft, on the south-western crop, the footwall country is a basic crystalline rock; the wall itself is ill-defined, but a smooth face has been found about 2 ft. in from the formation, which dips 5 in 1 to the north-east, varies from 9 in. to 2 ft. in thickness, and consists of crushed country replaced, in some parts, by quartz and, in others, by copper ores. The ore thus far has been richer in the south-eastern end, the dense limonite, beneath the surface quartz, having minutely interlacing veins of glance, with some specks of malachite, while tile-ore and crystalline malachite are appearing towards the bottom. Considerable boulders of a dense glance—presumably replaced limonite—are also found in the formation, stained on cracks by malachite.

A trench 10 ft. north-west of the main shaft has been opened on the quartz crop, and is reported to have touched ore, but has now fallen in.

The Cad cutting, opened in gossany quartz, proved fairly rich carbonate ore beneath.

The trench on the No. 2 lode tapped some medium ore, warranting further work on it.

On the south-western boundary there is a long crop of somewhat gossany quartzite, which might be tested in the more contracted parts by shallow holes.

BULL CREEK GROUP.

The group is named on the map after the Boundary. Bull Creek is a small affluent of Coppermine Creek, with a general course from west to east.

Porphyry outcrops are here as at the Dobbyn, very noticeable, especially towards the head of the creek.

The Boundary South (M.L. ——) is left out, as the holders failed to locate ore.

Boundary (M.L. 582).

Mgr., Lloyd.

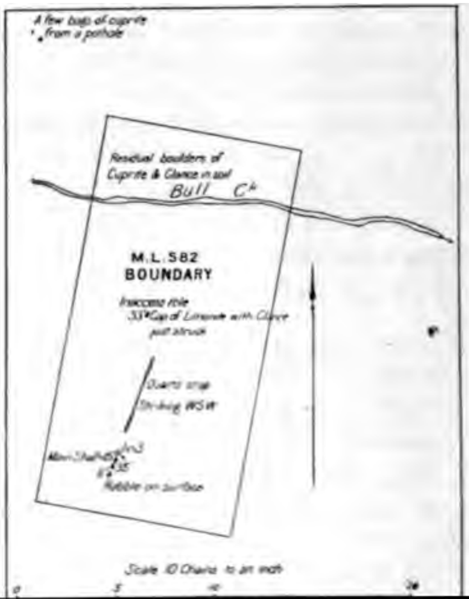
Location, Etc.

The Boundary is located on the western boundary of the Coolullah run, in the north-western corner of Coolullah Block No. 2 West, about 4 miles north of the Dobbyn freehold. Bull Creek, a tributary of the Coppermine, runs through the northern part of the lease.

The area of the lease is 20 acres.

Development.

The main workings are at the southern end of the lease. The working shaft is 45 ft. deep, and an air shaft (inaccessible), 12 ft. to the south, is 35 ft. deep. At the bottom of the main shaft, drives have been opened, north for 12 ft. and south for 10 ft. No stoping has been done, but the shaft is 10 ft. long and 5 ft. wide.


A few bags of cuprite from a pothole
Residual boulders of Cuprite & Glance in soil
Bull Ck
M.L. 582
BOUNDARY
Inaccess hole
35' Cap of Limonite with Glance just struck
Quartz strip
Striking WSW
Main Shaft 45'
35
Rubble on surface
Scale 10 Chains to an inch
0
5
10
20

ORE-BODIES.

The country rock is white, speckled, chloritic schist (possibly a crushed diorite), with segregated lenses of quartz, having a north-north-easterly trend. The cupriferous portion of the main ore-body makes little show on the surface, but the more siliceous parts are well marked.

In sinking the southern shafts boulders of rich ore were found to water level at 40 ft. On the 45-ft. level of the main shaft the copper ore is seen to occur in bunches in the lode, which itself is very irregular in width, the bulges being from 1 to 2 ft. thick. The copper ore at water level (40 ft.) is chiefly glance and with some chalcopyrite but small amounts of cuprite are found together with native copper. The gangue minerals are quartz (gossany in the northern level) and limonite (much of it siliceous). Some stains of malachite were noted and also a little chrysocolla.

The central shaft is a chain to the west of the line of strike of the main lode. Stains of carbonate and bunches of ore, with much calcareous sinter, were found in sinking and the cap of a lode, very jaspery in appearance but containing some glance, was struck at the bottom of the shaft. This, to judge by the ore at the brace, is worthy of further trial. The country rock here has suffered considerable alteration, being both softened and replaced to a large extent by earthy oxide of iron.

In the northern part of the lease scattered boulders of limonite, with glance and bunches of cuprite, coated with a thin film of chrysocolla, occur in the soil, with an abundance of sinter leached from the decomposed basic country rock. Solid rock has not yet been reached, and the lode has therefore not, so far, been located.

There would appear to be several overlapping lodes on this lease, though the work done does not allow of any very definite conclusions being drawn. The main lode strikes north-north-east, but the three groups of workings lie on a north and south line, and there is no sign of cross faulting.

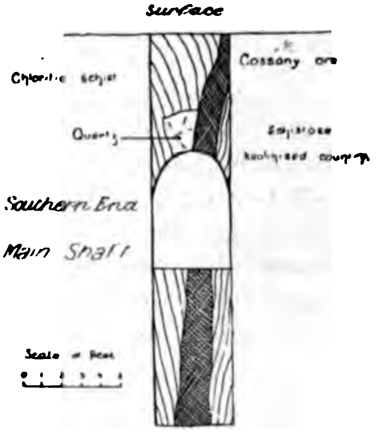
Decima (M.C. 304).

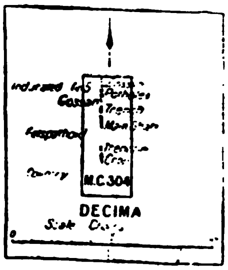
LOCATION, ETC.

The Decima lies on the reddish soil plain ½ mile south (slightly west) of the Boundary.

The vegetation consists almost entirely of stunted mountain (or desert) gum and spinifex.

The area, according to the Warden's register, is 400 ft. by 350 ft., but only half that area appears to have been pegged out. Unfortunately the claim, being under exemption, was deserted at the time of my inspection.





Development.

The workings comprise two potholes, (*a*) 2 ft. 6 in. and (*b*) 5 ft. deep, at 14 and 16 yds. from the northern boundary; a trench (*c*), 18 ft. long and up to 7 ft. deep, 15 yds. south of the last; an opencut (*d*), 23 ft. long, 2 ft. deep at the northern end, 5 ft. in the middle, and 10 ft. at the south; the main shaft (*e*) adjacent to the last, 20 ft. (?) deep, has a drive, 10 ft. in length, from the southern end, at 12 ft. below the surface; a trench (*f*), 16 yds. south of the shaft, 4 ft. deep;

Boundary workings. Its strike is due north and south, and it is nearly vertical. Between the main and northern workings it is especially noticeable, consisting of up to 2 ft. 6 in. of gossan.

In the northern pothole (*a*) the footwall, which is well defined, dips 5 in 1 to the east. The lode is pinching slightly (from 2 ft. to 18 in.), but should be sunk on. About ½ ton of siliceous carbonate "seconds," of 10% tenour lies at grass.

The exposure in the trench (*b*) is similar, except that much decomposed country is included in the ore at the north end and that stains of carbonate are visible on the footwall. Only 1 ton of siliceous carbonate "seconds" is at grass.

The footwall country, in the main opencut (*c*) and in the shaft (*d*), is seen to be schistose but kaolinised, the hanging-wall country in the shaft being chloritic schist, broken by spurs of quartz. The lode, consisting of cupriferous gossany ore, increases from 18 in. near the surface to 2 ft. in width towards the shaft bottom. It occurs on a well-marked break, the footwall country further being kaolinised to a greater extent than the hanging-wall, which, however, is rich in quartz veins. The exposures in the shaft and drive are indicative of permanence, and the cupriferous gossan of rich secondary ores, beneath whence sinking should be continued. Of the ore raised 280 bags (12 tons) lie stacked at the shaft, the seconds—siliceous carbonate bearing gossan, containing 15% copper—amounting to 3 tons.

The trench (*f*) shows only 12 in. of gossan, the footwall country here being indurated adjacent to the lode.

Water in the trench (*g*) prevents a complete examination, but 6 in. to 18 in. of gossan is visible in the ends—the crop extending for 20 ft. south of the trench. Only "seconds"—cellular siliceous gossan, with thin veins of chrysocolla and malachite (3% copper)—amounting to ½ ton, remain at grass.

Iguana (M.C. 268).

Mgr., Huddlestone.

LOCATION, ETC.

The Iguana lies ½ mile north of the Boundary.

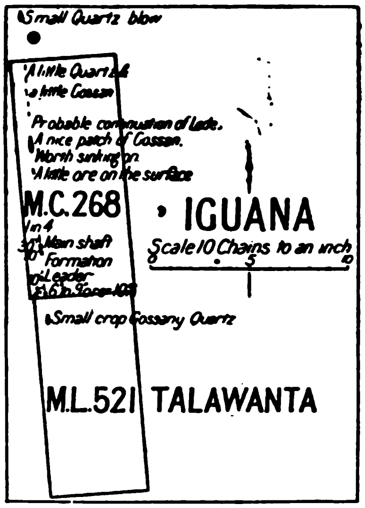
It is a mineral claim 800 ft. by 350 ft.—four men's ground.

OUTPUT.

Only 2 or 3 tons of ore have been shipped—yielding 37% copper, but 2 tons of ore lie bagged at the shaft ready for shipment. There are a few hundredweights of rich glance "firsts"—probably 40% ore—at the brace, and a few hundredweights of quartz-bearing limonite with radiating malachite, expected to carry 10 to 15% copper.

DEVELOPMENT.

On the southern boundary is a pothole (*a*) 4 ft. deep; a chain to the north is a hole (*b*), 10 ft. deep; a chain and a half further north is another (*c*) of the same depth. The main shaft (*d*), 20 ft. north of the last, is 30 ft. deep. Two men were at work here at the time of my visit.



ORE-BODIES.

The Iguana lode strikes north 5° west (dipping 4 in 1 westwards) and, if it continued southwards, would intersect Lloyd's main workings. The line of crop comprises small quartz blows, patches of

Cathedral (M.L. 573).

Location, Etc.

The Cathedral lies 1 mile west of the Boundary.

Its area is 20 ac. and the ground was formerly held as the Peacock claim.

It was idle at the time of my visits to the locality, no work having been done on it since its conversion from a claim.

Output.

1½ tons (red oxide) yielded 43% and 35%

,,

ST. PAUL'S GROUP.

St. Paul's Creek enters the Leichhardt River about half way between Coolullah and Kamileroi homesteads, draining a large area of country to the south-west.

Little work has been done on any of the crops, and no body of any importance has yet been discovered.

The Pelican was not visited.

Rosette (M.L. 638).

Mgr., Steel.

Location, Etc.

The Rosette lies ¾ mile east of St. Paul's Creek and 4 miles north-west of the Boundary.

This is a lease of 10 acres.

The main shaft, 20 ft. deep, is in the western corner of the lease; two potholes, 6 ft. and 5 ft. deep and 8 ft. apart, lie a chain to the south-east and a small trench has been opened in the northern corner.

Output.

	6	tons	shipped, Nov. '06,	expected 30%	(Mgr.)
	½	,,	firsts	yielded 40⅜%	(M.O'S)
		,	econds	,, 33⅝%	,,
Total	7	,,	shipped		

Ore-bodies.

The little work done here has not shown anything of promise—the ore occurring in bunches in small formations of no extent so far proved.

The main shaft has been sunk in copper-stained, kaolinised, chloritic schist, on a 12 in. formation, striking north 15° east, in which bunches of ore are found. The ore raised—malachite and glance—amounting to 6 tons has been shipped and is expected to yield 30%.

The western pothole exposed a formation 9 in. to 12 in. wide, while the eastern pothole shows a separate formation, 6 in wide, from which 1½ ton of malachite and tile-ore, assaying 42%, has been bagged.

At the northern trench there is a lenticular bunch of iron-stained quartz, in schist country, probably less than 20 ft. long but up to 10 ft. wide. The quartz is glassy and shattered, the cracks being lined with hydrated iron oxide, in which specks of gold have been detected by the manager.

The copper ores (carbonate and oxide) occur in a formation in juxtaposition to this. About 1½ ton of rich ore has been taken from the trench.

Lady Emma (M.C. 356).

LOCATION, ETC.

The Lady Emma is located 2 miles up St. Paul's Creek from Hill's Camp and the Chance.

There is one shaft 12 ft. deep.

OUTPUT.

5 tons shipped.

ORE-BODY.

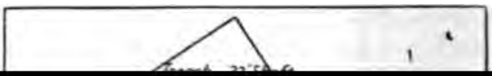
It is reported that the ore-body, which is of fair grade, is 2 ft. wide.

Chance (P.A. 283).

LOCATION, ETC.

The Chance lies 4¾ miles west of the Boundary and 1 mile beyond St. Paul's Creek.

Its extent is 10 ac.



DEVELOPMENT.

The main workings are in the northern corner of the area. The main shaft is 32 ft. deep and is now being sunk a further 10 ft. in search of bunches of ore. Separated from the main shaft by only 2 ft. is a pothole, 10 ft. deep on the east; and 10 ft. to the west there is a trench 10 ft. long, with a hole 10 ft. deep at the western end. A hole has been sunk 15 ft. 4 ch. to the west-south-west from the last, and a chain beyond to the south-west of there is a shaft 15 ft. deep.

OUTPUT.

2	tons shipped by previous holders, 43% and 35% copper (Seaton)				
6	,,	bagged at grass,	expect	37%	copper
6	,,	,,	,,	,, 30%	,,
3	,,	,,	,,	,, 40%	

ORE-BODIES.

The amount of work done on the Chance does not warrant certain expression as to whether there is one or more lodes, though the former has been assumed to be the case. The country in the area is a slaty rock, which, in the northern workings, is seen to be schistose. The occurrence of intrusive granite, only 10 ch. distant from the workings, is suggestive as to origin, but there are no pneumatolytic minerals accompanying the ores. Still the heat evolved by the granite must have aided solutions in dissolving the metals prior to precipitation in concentrated form.

The rich ore has evidently been originally chalcopyrite, but partial oxidation has taken place, through the whole mass, the iron producing limonite and the copper glance. These minerals now appear as a liver-coloured base, in which are scattered specks of yellow chalcopyrite.

At the main shaft the strike is west-north-west. It was opened on a 2 ft. formation, which widened to 2 ft. 6 in. at 20 ft. below the surface, but has pinched to 12 in. at the bottom. The formation, which is ill-defined, with very irregular walls, in parts consists entirely of crushed country but in others carries bunches of rich ore, some gossan, and quartz. Their scattered occurrence, however, renders exploitation somewhat expensive—only 10 tons of (37% to 42%) ore having been raised, of which 6 tons bagged are still on the ground. The ore at the brace, amounting to 5 cwt., consists of enriched chalcopyrite and glance and probably contains 60% copper.

The country rock at the main workings is schist the apparent strike of which is west-north-west, but granite occurs within 10 ch. to the east.

Only a 6 in. formation can be seen in the trench west of the shaft, but glance ore lies on the surface a chain further west.

The 25 ft. shaft has been sunk, in bleached country, on a very ferruginous formation, 2 ft. wide, consisting in great part of limonite, and containing tile-ore and chalcopyrite in limonite, but remarkably free from quartz. The ore at grass amounts to 6 tons, expected to yield 30% copper. Sinking should be continued here as the most promising place on the area.

The south-western shaft is at the contact of quartz, which crops on the surface for over a chain, and gossan, latter about 2 ft. thick and dipping steeply south-east. The country is slaty and the walls are not defined. Three tons of ore have been bagged from this shaft.

Queen Bee (M.C. 278).

LOCATION, ETC.

The Queen Bee lies 500 yds. south-south-east of the Chance, on a flat covered with mountain gum and spinifex.

This is an ordinary claim of two men's ground—400 ft. × 350 ft.

The main shaft which is 8 ft. long and 6 ft. wide is 25 ft. deep; and, 2½ ch. to the west-north-west, there is a hole 10 ft. deep.

OUTPUT.

1½ ton shipped, carrying 35 to 43% ore (Seaton)	
3 tons just shipped	expected to yield 20% copper
1 ton at grass	

ORE-BODIES.

Beyond that the claim is in metamorphosed sediments in the vicinity of granite and that the ores occur in an irregular formation

DONALDSON.

The mines north-west of the Donaldson telegraph station were the latest discoveries seen by me. They are situated on the eastern side of the Dromedary Range, which extends northwards for nearly 30 miles from Coolullah homestead.

The Black Nobby (M.L. 684) was not visited, and no particulars regarding it are available, except that it lies 8 or 10 miles north of the Eclipse Group.

ECLIPSE GROUP.

The group is located 9 miles west of the Cloncurry-Normanton telegraph line and is 68 miles north-by-west from Cloncurry.

The surrounding country is low-lying, being part of a peneplain, approaching the base level of the neighbouring rolling downs. The surface features much resemble those of the Duck Creek and other wide-bottomed valleys in the Cloncurry district.

The leases had not been surveyed when they were visited at the end of 1906, and the men on the ground were unable to give me the boundaries of the leases, consequently the particulars given below are somewhat indefinitely stated.

Metamorphism has been intense in this district, but it has taken place without the excessive crushing and the production of cupriferous quartz-bearing zones so typical of the greater part of the mineral field. The country rocks noticed include quartzite, hornblende-schist, felsite, pegmatite, etc., and quartz lenses are not as frequent as in most other parts of the field.

Stunted bloodwood is the most abundant timber, being generally accompanied by spinifex.

Eclipse (M.L. 571.)

Mgr., Hillcoat.

LOCATION, ETC.

The Eclipse is situated 12 miles north-west of Donaldson telegraph station which is 58½ miles north-by-west of Cloncurry.

Its area is 10 ac.

DEVELOPMENT.

The workings, which are all in a state of collapse, begin 4 ch. north-west of the south-eastern corner of the lease, with 2 potholes, the eastern 5 ft. and the western 6 ft. deep, 1 ch. north of which is the main shaft, 15 ft. deep. A third pothole 5 ft. deep lies 20 ft. south-west of the main shaft. The northern shaft, about 15 ft. deep, is 3 ch. north-north-west of the main shaft. At 20 ft. south-east of this shaft there is a trench 8 ft. long, 6 ft. wide, and 4 ft. deep.

OUTPUT.

1906 ... 17 tons shipped
20 ,, at grass, 30%

ORE-BODIES.

The country rocks here are highly metamorphosed, hornblende-schist being much in evidence in the southern part of the lease. Towards the north there is also a considerable development of granophyric and some pegmatitic structure, in the more siliceous and felspathic rocks. Almost all the openings on the lease appear to be on different ore-bodies.

The main shaft is on an irregular north and south striking bunch of high grade liver-coloured ore (an intimate mixture of chalcopyrite, tile-ore, limonite, and chalcocite with disseminations and veinlets of malachite). The body is 3 to 4 ft. wide at the surface but at 8 ft. below it is from 6 in. to 3 ft. wide. About 10 tons of 30% ore lie at grass. The country adjacent to the ore is a decomposed rock, probably slate.

At the 5 ft. hole to the south, which is on the same line, 5 tons of 30% ore have been paddocked, while at the adjacent hole there is the same quantity of 35% ore.

The hole to the south-west of the main shaft has produced 1 ton of 40% liver-coloured ore.

Gossan can be seen on the surface at the northern shaft but there [redacted]

Lady Molly (M.L. 620).

Mgr., Hillcoat.

LOCATION, ETC.

The Lady Molly adjoins the Eclipse on the north.

Its area is 10 ac.

Only two or three shallow potholes have been opened on this lease about ½ mile north of those on the Eclipse.

ORE-BODIES.

The country rock here has the appearance of highly altered sedimentaries, in which segregation and crystallisation has taken place with the production of a pegmatitic structure in parts. Small ore-bodies, 18 in. wide, have been exposed on a north and south line in the eastern holes, but only a couple of hundredweights of payable ore have been saved.

A belt of quartzites, lying 1 ch. to the west, shows slight indications of copper contents, and a small hole, in sintery red soil at the northern end of the belt, has yielded a few pounds weight of copper ore.

Work is therefore not to be encouraged here.

Cosmo (M.L. 668).

Mgr., Hillcoat.

LOCATION, ETC.

The Cosmo adjoins the Lady Molly on the west.

Its area is 10 ac.

Wanderer (M.L. 622).

Mgr., Hillcoat.

LOCATION, ETC.

The Wanderer lies ½ mile west of the Cosmo.

Its area is 15 ac.

One pothole 5 ft. deep has been opened.

OUTPUT.

3 tons of ore raised, carrying 30% copper.

ORE-BODY.

The ore obtained appears to have been in the form of a small bunch. Cellular gossan was found on the surface and underneath it fine-grained glance-malachite-tile-ore, rich in iron but free from quartz.

Hornblende schist and an altered porphyroidal rock occur in the vicinity. The sedimentaries are highly altered and pegmatitic segregations are very common, more especially on a line running north-east and south-west within a few feet of the pothole. Actinolite is here a very abundant secondary mineral.

Nothing to encourage further work was seen here.

GUNPOWDER CREEK.

Gunpowder Creek rises near Kennedy's Gap on the West Leichhardt telegraph line, and flows northwards to within a few miles of Mount Oxide, when it bends and runs east-north-east to the Leichhardt River. The country within its catchment is mostly mountainous, and uninviting for most purposes.

CALTON HILLS GROUP.

Only one lease had been taken up here at the end of 1906, to my knowledge.

Overlander (M.L. 661).

LOCATION, ETC.

The Overlander is 17 miles down Gunpowder Creek from Calton Hills homestead, which is 81 miles west-north-west of Cloncurry.

Its area is 10 ac. The lease was not inspected.

Rich specimens of radiating malachite in quartz were shown me by one of the owners, who reported the mineral to be plentiful.

BIG BEN GROUP.

This group is to the north and on the opposite side of Gunpowder Creek to the Overlander.

Besides that described below, there are the Big Ben No. 1

MOUNT OXIDE.

Mount Oxide is located between Torpedo Creek (a branch of Gunpowder Creek) and Myally Creek (a tributary of the Leichhardt River). It is in the extreme north-west of the district considered in this report.

MOUNT OXIDE GROUP.

Mgr., Douglas Henry.

Location, Etc.

Mount Oxide lies in about the centre of the triangle formed by joining Camooweal, Burketown, and Cloncurry. The nearest human habitation at the present time is Alsace, 25 miles down Gunpowder Creek; its distance, in an air line from Burketown, being 123 miles and from Cloncurry 109 miles.

The leases are strung along a precipitous ridge, near the head of a branch of Torpedo Creek, 6 miles above the junction of the latter with Gunpowder Creek, a stream of some importance, entering the Leichhardt River between Kamileroi and Lorraine head stations.

A track for vehicles has lately been made, *viâ* Myally Creek, from the mine to Lorraine, on the Cloncurry-Burketown road (60 miles), but horsemen generally prefer the short cut (50 miles) from Kamilaroi, *viâ* Alsace. A camel pad westwards has lately been opened down the Thornton River to the Camooweal-Burketown road (55 miles).

Literature.

(4) The following are Mr. Cameron's statements:

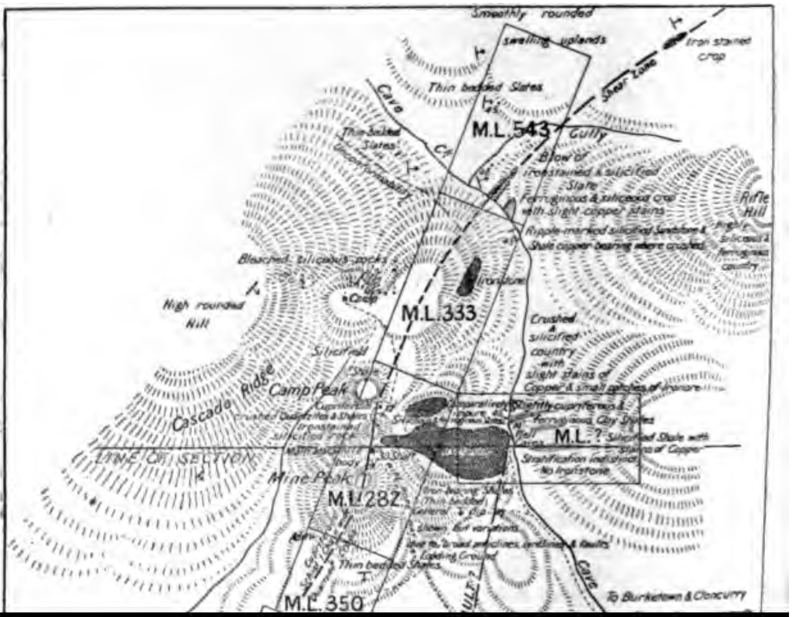
The crest of the spur is formed by a band of bedded quartzites which outcrop along it, striking about south 30 degrees west, and dipping steeply to the east. Underlying this quartzite belt is a bed of clay shales. The lode consists apparently of the upper beds of these shales impregnated with fine quartz veins and copper ores. It shows as a very prominent outcrop along the crest of the hill for a distance of some 10 chains in length, and is in places 40 feet in breadth. An average sample across the southern end of the outcrop gave a return of 1·3 per cent. of copper, a trace of gold, and 9 dwt. 2 gr. of silver per ton. Another average sample taken from across the lode about 8 chains further north gave a return of 28 per cent. of copper, a trace of gold, and 1 oz. 10 dwt. 1 gr. of silver per ton. The lode here is about 10 feet in width, and is more ferruginous and quartzy in character, and continues so for about 2 chains further north. Beyond this it can be traced for a further distance of about 5 chains by detached outcrops of quartz and carbonate ore. This lode will be an expensive one to work from its inaccessibility, but otherwise it shows very good prospects. The initial prospecting could very easily be done by open cuts across the lode from the western side before any more elaborate work was taken in hand.

(7) Mr. Rutherford concludes:

The outcrop is made up of a prominent ridge of bedded quartzite running in a north and south direction for a distance of 300 yds. Underlying the quartzite is in places a band of shale which is generally more stained with green carbonate than the quartzite itself. The "stained" formation varies in thickness from a few feet up to 40 ft. in places. At a place 130 yds. from the extreme northern end the formation is 15 ft. wide. Three feet of this carries some good copper ore for a distance of 17 yds. This is the only place where any body of ore can be seen. It is my opinion that a bulk assay right across the formation in any other part would not yield more than a trace of copper.

HISTORY.

Mr. Henry was taken by blacks to Mount Oxide about 25 years ago. He secured the ground in 1900, and placed it, on option, in the hands of the Burketown Railway Company, who abandoned it in 1903. Early in 1905, Mr. Henry again pegged out the ground and placed his son in charge. On my arrival at the mine, Mr. Douglas Henry had four men with him.


Smoothly rounded
swelling uplands
Iron stained crop
Shear Zone
Thin bedded Slates
Cave
M.L. 543
Gully
Thin bedded Slates
Unconformability
Ck
Blow of ironstained & silicified Slate
Ferruginous & siliceous crop with slight copper stains
Rifle Hill
Ripple-marked silicified Sandstone & Shale copper bearing where crushed
Highly siliceous & ferruginous country
Bleached siliceous rocks
Crop
Ironstone
High rounded Hill
M.L. 333
Crushed & silicified country with slight stains of Copper & small patches of ironore
Silicified
Shale
Camp Peak
Cascade Ridge
Crushed Quartzites & Shales
Ironstained silicified shale
Slightly cupriferous & Ferruginous Clay Shales
M.L. ?
Silicified Shale with Stains of Copper
Stratification indistinct No Ironstone
LINE OF SECTION
Mine Peak
M.L. 282
Iron bearing Shales
Thin bedded
Shows broad anticlines, synclines & faults
Folding Ground
Thin bedded Shales
M.L. 350
FAULT ?
Cave
To Burketown & Cloncurry

DEVELOPMENT.

The main workings are on M.L. 282: A 30-ft. shaft, and an opencut, 8 ft. deep, 8 ft. wide and 20 ft. long, just to the south-west of the shaft. Three chains to the north is an abandoned shaft, 10 ft. deep.

In the north-western corner of M.L. 350 an adit, now 7 ft. long, has been commenced nearly 100 ft. below the ridge top.

In the south-western corner of M.L. 544, a well has been sunk, to a depth of 70 ft. in purple and yellowish-green fissile slate. Very little water was obtained.

On M.L. (?) is a 14-ft. well, giving a fair supply of water for one man.

The workings being in the initial stage, the ore-raising appliance consisted simply of a windlass and a No. 4 wire rope-way to the loading ground, 8½ ch. distant.

OUTPUT.

1905	...	40	tons	ore,	containing	30%	copper	
1906	...	40	,,	,,	,,	30%	,,	
		30	,,	,,	,,	40%	,,	(estimated)
Total		110	,,	,,	,,	33%	,,	,,

ORE DEVELOPED.

The main ore-body has not yet been sufficiently opened up for a reliable estimate of ore available to be made. At the time of my visit the main bunch of ore could be traced, on the surface, a distance of 2½ chains, but had been properly exposed only in the opencut and shaft. It may, however, reasonably be assumed that ore will be found between the surface and lines joining the ends of the crop and the shaft bottom. The average width remaining 3 ft., over 700 tons, which ought to run between 20 and 30%, should be available.

No work has been done on the cupriferous schists, and therefore no opinion can be expressed as to their value.

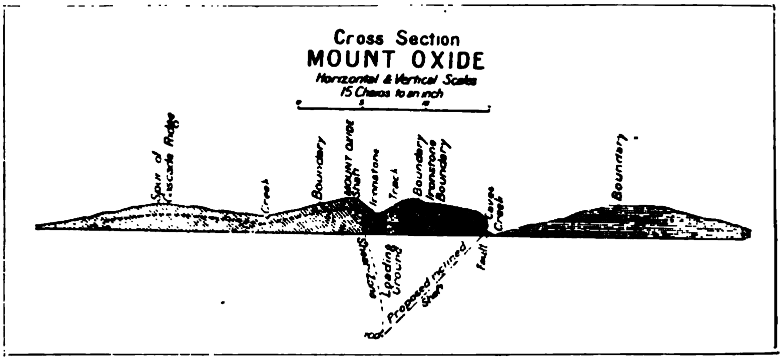
TREATMENT AND TRANSPORT.

The only treatment the ore receives at the mine is a rough sorting by hand, prior to bagging. When bagged it is carried 55 miles by camel to the Thornton Hotel, on the Burketown road, where it is transferred to horse teams, on their way to Burketown, and thence shipped to Southern smelters.

GEOLOGY AND MINERALOGY.

The Mount Oxide ore-bodies lie along a shear-zone, which is traceable for several miles, at least to Torpedo Creek on the south, but has not yet been proved cupriferous beyond Henry's leases.

The country rocks to the west are fissile slates, dipping at an angle of 45° to the south-east; to the north-east, the country is highly silicified and shows little trace of stratification (any observed having a southerly dip); but, to the south-east, occur apparently overlying, thin-bedded, calcareous slates, forming a broad geo-syncline, with north and south major axis.



Along the shear-zone, the slates have been rendered **schistose**, generally highly siliceous, and in places cupriferous. One bunch of high-grade oxychloride has been found and is being exploited in the main shaft (*see* Mount Oxide—M.L. 282).

Between the shear-zone of Mount Oxide on the west and a fault and crush zone in Cave Creek on the east, several bodies of ironstone occur. The largest crop (at the Caves) is 300 ft. wide tapering down to less than 100 ft. at the western extremity. The eastern end is rendered conspicuous by its towering 100 ft. above the creek.

Reference to the occurrence and composition of these iron ores will be found elsewhere.

There is a probability that all the above strata are of the same

ntains as impurity only from 20 to 30% of clay, indicating replacement of decomposed country.

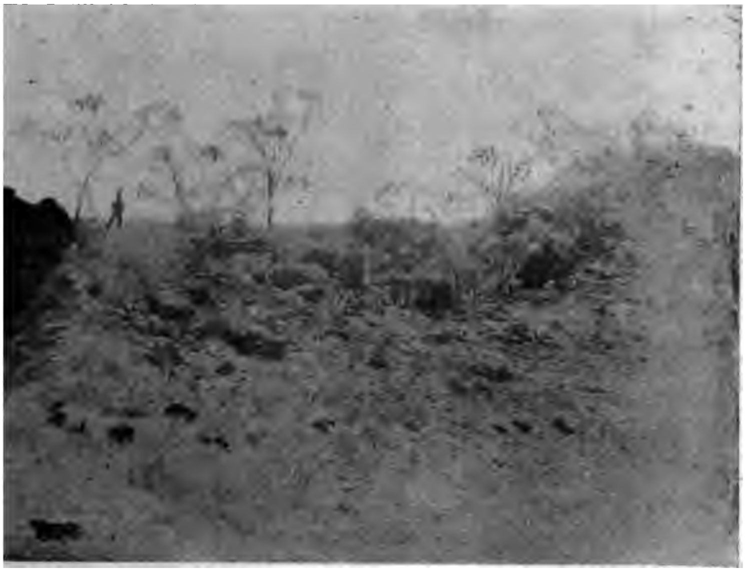


FIG. 25.—MAIN SHAFT, MOUNT OXIDE. [*L. C. B., photo.*

The same ore-body has been exposed by open-cutting, over a stance of 20 ft., to within 15 ft. of the shaft, the face there being ft. in width, and in the centre of the cut it is 8 ft. wide. At the shaft e crop is only 5 ft. wide, and thence tapers out within 20 ft. to the rth.

Between 25 or 30 tons of ore now lie stacked at the shaft, ready r bagging. My sample, taken from the surface of this heap, contains ystalline atacamite, both with and without interstitial earthy red ide of iron; crystalline atacamite, between laminæ of kaolinised hist; and earthy malachite and red oxide (tile-ore), with crystalline acamite drusy on the walls of cavities. The following is its analysis overnment Analyst):

Copper ... ... = 38·6%
Gold ... ... = 19 gr. per ton
Silver ... ... = 1 oz. 18 dwt. ,,

The 15 tons of seconds, at grass, containing a large amount of acamite (acicular and green), probably run 20% copper.

The body continues on the west of a silicified gossany crop for arly a chain south of the opencut, the amount of copper rapidly creasing. About 2 ch. south of the cut, is silicified slate highly stained—but only on the surface—by green carbonate. This forms the footwall country of a very ferruginous, sometimes gossany, body of silicified slate, which may be found to carry occasional bunches of copper ore in depth.

Some 20 ft. north of the main shaft there is a crop, 2 ch. in length, of iron-stained silicified rock, on the eastern side of a thin belt of copper-stained schistose slate, in which quartz lenses have segregated. North again of these crops silicified crushed schist and quartzite, 30 ft. wide, rise above the surface for nearly a chain.

In appearance the crop much resembles the Chinaman, on Duck Creek, except in that, though so siliceous, it contains few bunches of pure quartz. This crushed country contains copper, but seldom to the amount of 10%, though the surface is generally green painted.

The body has been left exposed, for a height of 30 ft. on the east, by the denudation of the adjacent country and it could therefore be easily tested by an adit, but instead a shaft has been begun a few feet north-east of the cliff to catch the body on the underlie.

North of the shaft, the cupriferous portion is only 3 or 4 ft. thick, and it thins out altogether within a chain.

Towards the southern boundary of the lease the footwall schists are strongly stained by blue and green carbonates, over a width of a chain, the slates, both east and west, being both ferruginous and siliceous.

Mount Oxide No. 1 East (M.L. ?)

Another crush-zone, an extension of the Cave Creek fault, traverses the north-eastern corner of the lease, and here stains and fillings of malachite and tile-ore are found in crushed, ripple-marked, indurated sandstone, the grade of which is very low.

Mount Oxide No. 2 North (M.L. 543).

The crush-zones continue through the south-eastern corner of this lease, and slight stains of copper ore are visible.

Mount Oxide No. 1 South (M.L. 350).

The quartzites and schists of the main crush-zone crop through this lease, the latter, however, pinching out towards the south. The schist is rather gossany and sometimes contains stains of malachite. It is covered to some extent by talus, and no work has been done on it, but an adit has been begun on the western side of the ridge, ½ ch. from the northern boundary, and this is intended to intersect the schist, 50 ft. below the crop.

Mount Oxide No. 2 South (M.L. 544).

A belt of silicified country traverses this lease from north to south, and a shaft has been sunk in the footwall country in the south-western corner, but no copper has been found.

MOUNT GORDON GROUP.

Mount Gordon is located adjacent to Oxide Creek, 2 miles north-north-east of Mount Oxide, and overlooks the Burketown road and Alsace bridle-track.

Four leases are in force here: Mount Gordon (M.L. 597), Mount Gordon No. 1 North (M.L. 598), Mount Gordon No. 1 South (M.L. 599), and Mount Gordon No. 2 South (M.L. 600)—each of 10 acres.

No work has been done on any of them except M.L. 597, and the ground was quite deserted during my stay in the district.

Mount Gordon (M.L. 597).

Location.

This lease is situated on the southern side of Oxide Creek.

Development.

A trench, 6 ft. long, 3 ft. wide, and 1 ft. deep, has been opened in the northern portion of the lease but failed to locate ore. No work has been done on the main crop, which should first be examined by trenching; and then if indications warrant it an adit might be opened, either from the north or south, along the cupriferous zone. Alternatively a shaft might be sunk on the crop itself and crosscuts opened at various depths.

ORE-BODIES.

No lode has been found here, the copper ore occurring in patches, in a north and south belt of siliceous slates, together with much hæmatite. The copper ore in the main crop on the hill-top, near the centre of the lease, is chiefly malachite, which occurs in veinlets both on the bedding planes and in joints, and also disseminated in the solid country rock, which has a greenish tinge when broken. Carbonates are especially well developed at one spot, where the quartzite has been crushed in a similar manner to parts of the Chinaman crop at Duck Creek.

APPENDIX.

BURKE RIVER (Continued).

MOUNT BIRNIE GROUP (Continued).

Mount Birnie (M.L. 686, Etc.).

Since the above was written, Mr. Harrison, of Boulia, has sent me a collection of specimens from the mine. From these it is inferred that the country in which the ore-bodies occur consists of hornblendic schist. In the crop at the main shaft (since deepened), cuprite is found, gradually shading into limonite and coated with chrysocolla. At shallow depths earthy malachite, sometimes intimately mixed with chalcocite, is found, and at 30 ft. beneath the surface massive metallic chalcocite, carrying crystals of pyrite, appears. Masses of chalcopyrite occur in the schist between 54 and 86 ft. depths, being accompanied by leached pyrite and coated with earthy chalcocite for the lowest 10 ft. (where the body is 3 ft. wide).

Rich specimens, showing intimately mixed chalcocite, malachite, and limonite, sometimes with coatings of chrysocolla, have come from Nos. 2, 3, 5, 6, 7, and Green's shafts, metallic chalcocite from 10 ft. depth in No. 7 shaft also exhibiting disseminated chalcopyrite.

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The Great Fitzroy Copper and Gold Mine,

MOUNT CHALMERS (ROCKHAMPTON DISTRICT).

◆

INTRODUCTION.

Mount Chalmers is the name given many years ago to an old mining locality situated about ten and a-half miles directly north-east of the City of Rockhampton and close to the Emu Park Railway Line. The nearest railway stations to it are New Zealand Gully and Tungamull, the former being fifteen miles from Rockhampton and about four miles from the Fitzroy Copper Mine, the road between the station and the mine being a fairly good one. Tungamull is eighteen miles from Rockhampton and about three miles from the mine, the station and the mine being connected by a bush track. The mine, roads, railway stations, etc., are shown on the accompanying Locality Plan. (Plate 1.)

Close to Rockhampton, on the north side of the Fitzroy River, are the lofty Berserker Ranges, and at the base of these mountains, on the northern side, is Nankine Creek, the stream which separates the Mount Chalmers country from the Berserkers.

Nankine Creek is one of the branches of New Zealand Gully and drains the country about Mount Chalmers, but it is an insignificant watercourse, and although a swollen torrent in wet seasons, does not usually carry much water, and frequently is dried up altogether.

Some of the hills near the mines have very steep slopes, and offer very fine sites for metallurgical works should it be found desirable to erect plant for the treatment of the ores in the vicinity. There are other localities close to the mines where the ground is gently undulating, and where natural advantages exist for limited water conservation in the construction of dams across the gullies and creeks.

Facilities for railway construction also exist between Mount Chalmers and the Emu Park-Rockhampton Railway Line, and easy gradients can be found from either Tungamull or New Zealand Gully to the top of any metallurgical works which might be built on the hill-slopes near the mine. Connections with either of these stations also establishes ready access to the Fitzroy River, as the railway passes close to the northern bank.

The general position of the surface works at the mines, and the topographical features in the immediate vicinity, are shown on Plate 2. The altitudes represented by red contour lines on that plan are from aneroid measurements, and are, therefore, only approximately correct.

GENERAL GEOLOGICAL FEATURES.

The rocks at and around the mines at Mount Chalmers belong to the Gympie (Marine) Series of the Permo-Carboniferous System, and comprise shales, quartzites, and interbedded dolerite. About a mile to the north-west, at Mount Warminster, the rocks consist of shales, quartzites, dolerite, and serpentine, the two latter apparently interbedded with the two former. To the east and north-east of Mount Chalmers there are shales, dolerite, and ferruginous sandstones, closely associated, and perhaps interbedded, with serpentine and fossiliferous limestone.

The neighbourhood of the Mount Chalmers mineral deposits seem to be a region where considerable alteration has taken place in the rocks, both in structure and composition, while at some distance away, more particularly to the east of Mount Chalmers, the sedimentary beds have been subjected to less alteration, the limestones which occur there, and which contain well preserved marine fossils, only being slightly changed.

At Mount Chalmers there are outcrops of an altered greenish felspathic rock exposed close to the mine, and on the low ridges in the neighbourhood some of the outcrops show the rock to partake of the character and composition of a dolerite. With the dolerite there are clay shales and barium-bearing shales, the three rocks being interbedded with one another, the whole, as a series, having the same trend and dip as the boundary walls of the copper-gold deposits.

The barium shales are somewhat irregular in stratification and are generally much decomposed near the surface. The barium is in occur at Tungamull, a few miles to the east of the mines, interbedded with rocks similar to those associated with the quartzites at Mount Chalmers, but, unlike the latter, have not been subjected to such alteration.

Where the rocks in the Mount Chalmers-Berserker mineral area are much altered it is noticed that limestones are absent, except as small veins of recent formation, yet the fossils in the greenish felspathic sandstones in and around the Berserkers show that the rocks there have been formed under marine conditions and that limestones may once have existed there. Hand specimens of the quartzites show structure very like that of limestones which have been partly changed into silica, and Fig. 1, which is a reproduction of a weathered specimen of quartzite from Rankine Hill, at Mount Chalmers, well illustrates this structure. The white portion in the illustration is quartzite, and the effect is due to the alteration of the limestone by the infiltration of silica along the bedding and joint planes, the other portions being weathered away.

In the Fitzroy Mines the quartzites have been found to merge into a rock mostly made up of silica, with a small proportion of metallic sulphides, and this in turn has imperceptibly been changed into massive sulphide ore with a comparatively small proportion of silica. It is the latter class of ore which contains the high values in copper, while the quartzites, approaching the other extreme, gradually loses its cupriferous character and becomes more defined as a gold-and-silver ore. If the quartzites have been formed by the replacement of limestone by silica, and if they gradually merge into sulphides, then the whole of the mass, it may be assumed, was originally limestone.

There can be no objection in assuming that one portion of a large mass of limestone is replaced by silica, and that the other portion is changed to metallic sulphides, but there is a probability, in the Fitzroy Mines, that whilst the quartzites are derived from limestone, the sulphides are due to the alteration, not of the limestone, but of extensive beds of serpentine. At Mount Warminster a bed of serpentine rests on the cupriferous clay shales now being worked there for copper, and where this bed is exposed in one of the watercourses near the mine workings it presents certain characters closely resembling those of the sulphide ore-body at the Fitzroy Mines.

The Warminster serpentine is, as a whole, very compact and without stratification, but parts of it are finely foliated where there are present rounded fragments and masses of a bright red jasper, the lines of foliation conforming somewhat with the shape of the jasper inclusions. The jasper is exclusively confined to the serpentine, and is conspicuous and abundant where the serpentine is of a finer quality, and seems to be a product of alteration of the rock from which the serpentine itself was formed.

The whole of the above paragraph (with the exception of th latter portion of the last sentence, and if the word *serpentine* i replaced by the words *copper-iron sulphides*) might also describe th characters of the sulphide ore bodies at the Fitzroy Mines. There i the same massive appearanace and the same foliation around th bright red jasper, and there is also a better quality of ore where th jasper inclusions are present than where they are absent. Thes features, when taken in conjunction with the fact that a slaty serpentine occurs close to the mines, and that the ore body contain magnesia, suggest the probability that metasomatic action has produced the sulphides by the replacement of serpentinous matter Fig. 2, on page 8, is a reproduction of a hand specimen of copper o from the northern end of the workings in the Fitzroy Mines, an shows the foliation of the sulphides around the jasper inclusions. Th same figure might also be taken to represent a specimen of th serpentine at Mount Warminster containing red jasper.

Dyke rocks at Mount Chalmers have been met with in severa of the mine workings, and have been proved to occur both in th ore bodies and in the adjacent country rocks. At the northern en of the workings the dykes appear to have a general north-west an south-east trend, and are nearly vertical, but developments may alte this aspect of their behaviour, and they may be found to consist of a network of intrusions, varying in thickness from a few inches to severa feet. The workings on the southern end of the mines have als revealed similar intrusions, but their characters have not yet bee defined. The dyke rock always occurs as a bluish-white clay, not yet being observed undecomposed, so its original mineral constitution is

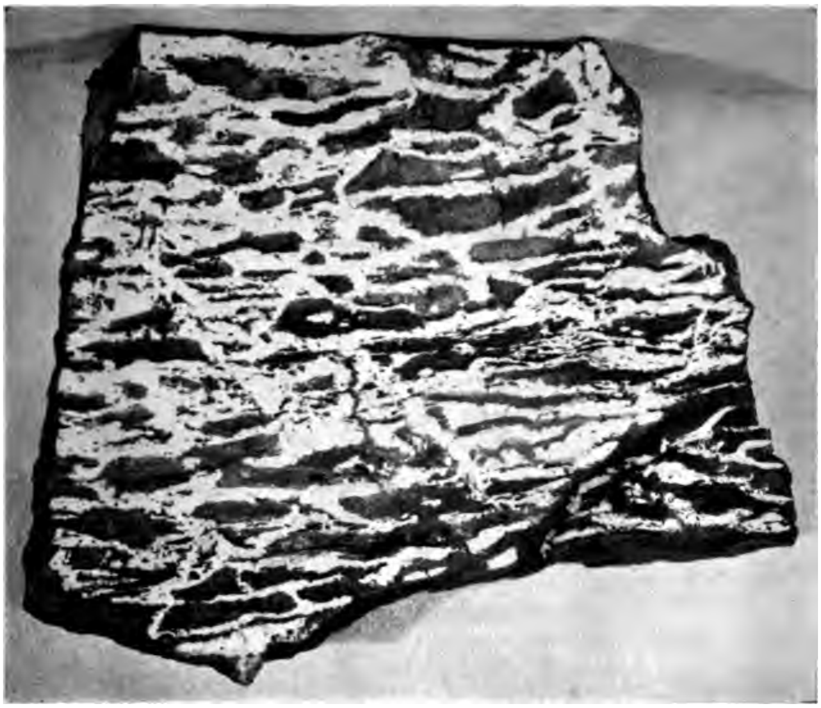


Fig 1.

SPECIMEN OF QUARTZITE FROM RANKINE HILL, MOUNT CHALMERS.

Showing the formation of veins of silica along the joints in the rock.

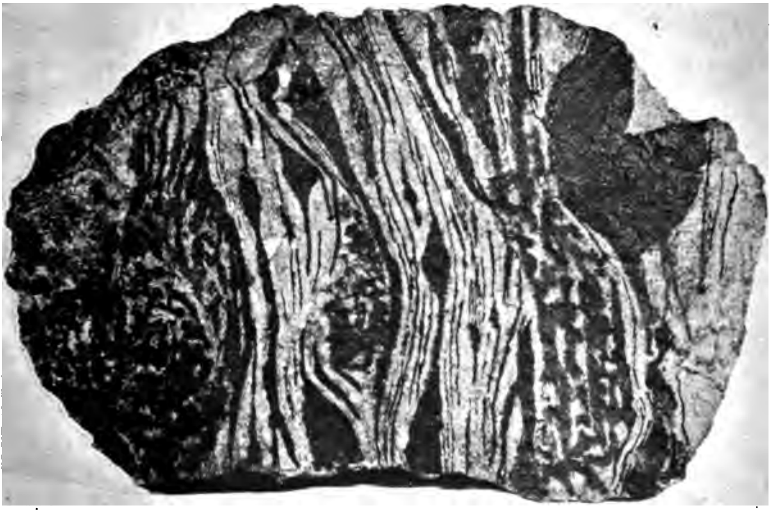


Fig. 2.

SPECIMEN OF COPPER ORE FROM THE NORTHERN WORKINGS, FITZROY MINE.

Showing the sulphides (white in the illustration) foliated around the jasper inclusions.

tendency to consider them, exclusively, as bedding planes in agreeing with the strata in angle of dip, and closely with them in direction of strike, and unless they are carefully watched as the work proceeds there will always be the chance of following them into poor country. The lode is not always to be distinguished from the adjacent rocks, and is frequently quite barren, and in following a joint plane instead of a wall or bedding plane a needless amount of work might be entailed.

The rocks exposed in the workings of "A" shaft show that the country has also been disturbed in a way quite distinct from the movements that produce joint planes, the result of which is shown in the breaking up of the quartzites into innumerable fragments. This character of the quartzites in the "A" shaft workings is due simply to irregular crushing movements in the rock masses, and not to weathering agencies as has been suggested. The breaking up of the quartzites into fragments makes the beds very friable, the latter having a tendency to crumble away in the old workings where clayey matter has accumulated in the fine crevices between the fragments.

The weathering action taking place in the rocks and in the ore bodies close to the surface has produced several changes in their composition. The iron pyrites contained in the quartzites have become oxidised, giving to the rocks a reddish colour, and where the quantity of this mineral in the quartzites has been great the oxidation has produced a ferruginous gossan. In the Adit Level this gossan occurs in large quantities, other localities where it is found being in the upper workings in the East Shaft, and the surface workings on the outcrop of the quartzite in the triangle formed by the North Shaft, "A" Shaft, and West Shaft. The gossan does not contain copper or zinc, or any sulphide ore, and the gold contained in it is probably in a favourable condition for easy recovery.

Where the quartzites are not ferruginous they are frequently mixed with a whitish clayey substance derived from the decomposed clay shales in the vicinity. This clay is generally kaolin, but is sometimes mixed with greasy talcose material.

It has been a cause of surprise that the occurrence of large bodies of copper ore, as revealed in the workings, was not indicated by any defined surface features. The quartzites which contain the gold on the surface do not carry copper, except in traces, although, as stated, the porous nature of some portions of the lode shows that mineral of some kind has been weathered out of the stone. Having these favourable indications as a guide, a large amount of prospecting for gold has been carried out at various times. The total absence of copper indications, at least on the northern end, is accounted for by the fact that the large body of sulphide ore has never been exposed on the surface, that in this part of the lode the quartzites form a hard and compact outcrop, which has not only itself withstood all weathering action, but has to a great extent prevented the oxidation of the sulphides occurring just below. Taking all the circumstances into consideration, no doubt much of the development which has been instrumental in proving the large copper-gold deposit would not have been undertaken if it simply depended on geological indications, so that its discovery must in a great measure be credited to the personal endeavours and convictions of those who undertook the work.

LIMITS OF THE ORE DEPOSITS.

The workings at the northern end of the mines have disclosed well-defined walls of clay shales in marked contrast with the adjacent ore deposits, and leave no room to doubt that the limit of the sulphides there has been reached. In the top (adit) level the northerly workings exposed a wall having an inclination to the north at about an angle of forty degrees. This wall has been traced to the eastern side, being found in the workings close to the north shaft, and also further south at the winze, where it was followed down on the underlie to a depth of forty feet. The angle of inclination of the wall at the Adit Level is about sixty degrees from the horizontal, but in the winze the dip is less, gradually flattening to an angle of thirty degrees at the bottom. The eastern workings on the same level are all in quartzite, and a wall has not yet been found. These features are shown on Plates 3 to 9.

No. 1 (120 ft.) Level has not been sufficiently extended to expose a wall, but No. 2 (150 feet) Level has been driven northerly into massive sulphides, meeting at the end a wall of country rock having that the beds at the two above-mentioned localities conform with the inclination of the massive quartzites which occur easterly and south-easterly from them. This is illustrated in section on Plate 5.

The old surface workings to the west of the Adit Level are all in ferruginous quartzites, and No. 1 Shaft, and also the open-cut leading into it from the south, have shown that the clay shales resting on the quartzites have a dip to the north-east. This dip becomes easterly where the shales are exposed a little further to the south, and westerly a short distance to the east, the easterly and westerly dip together forming a syncline. The quartzites also conform with this change of inclination of the shales above them. Following the surface features from the syncline at the No. 1 Old Workings towards the north-east, it is apparent that the shales connect with similar strata met with in the workings in the Adit Level.

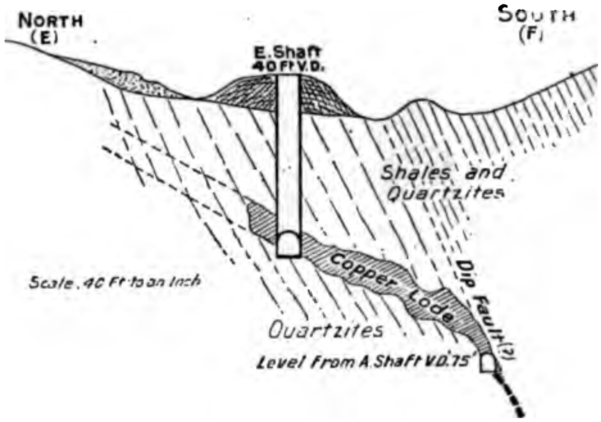
The trend of the shales from No. 1 Shaft appears to be towards the north-west, then they turn around to connect with the shales in the western workings, the dip changing from north-east to north, and then to north-west.

The depression of the quartzites in the synclinal fold divides the lode into two great lobes, the probable configuration at the various depths being represented on the Plate 3 by dotted parallel lines, while their probable direction of dip is represented by arrows. These features are also shown on Plates 4 and 5, the dotted lines representing, in section, the synclinal foldings and the probable dip of the lode in the direction of the West Shaft.

The clay shales on the surface near the North Shaft follow the quartzite outcrop around towards the east, and the eastern contour of the quartzites, dipping easterly, is probably the limit of the ore body at this level, the watercourse here being close to the junction of the quartzites and the clay shales. Following this watercourse around the quartzite outcrop in a southerly direction, the shales are found to be exposed in the workings of the East Shaft, their general character and behaviour being similar to those at the western workings, but having a dip to the southward.

Between "A" Shaft and East Shaft the underground workings indicate that the quartzites and shales are undulating, and vary in direction of dip, but that they have a general southerly inclination of about 45 degrees, as shown on Plate 4 and Fig. 4. On the surface there are beds of quartzites, shales, and slaty serpentine exposed in the excavations near "A" Shaft, having the same behaviour as the rocks below. The trend of the quartzites continues regularly to "A" Shaft, which then changes to the north-west, the workings showing very decidedly this to be their direction. The wall exposed in the drive to the south of "A" Shaft partly traverses the line of junction between quartzites and shales, but in the western end there is evidence to show that this wall is a fault-plane, although agreeing partly with the bedding plane of the strata. To continue the workings in this direction would result in meeting with country that is not mineral-bearing.

Fig. 3.



SECTION ACROSS EAST SHAFT (ON LINE E.F. ON PLATE 3).

Showing the copper lode, the dip fault (?), and the general southerly dip of the quartzites.

From the north-western workings of "A" Shaft, the quartzites must turn very sharply to the west to conform with the fold at the No. 1 Old Workings, and also with the outcrops further west, and they must then gradually curve round to meet the quartzites close to the Windlass Shaft, the dip of the rocks changing from south to south-west, and then to west. The plan of the workings on Plate 3, and the vertical sections on Plates 4 and 5 will illustrate the mode of occurrence of the ore deposits, which, with the description given above, will show that there is very little more to do to prove that the Great ck at the northern end, and also the northerly inclination here of the ıe of contact, the same illustration showing the southerly dip of the ıartzites in the workings connected with "A" Shaft. There is a obability that the under side, when found, will have a shape corres- ›nding in many respects with the upper side, and this view will ree with the opinion previously expressed, that the ore bodies might the result of alteration of serpentine and coralline limestone.

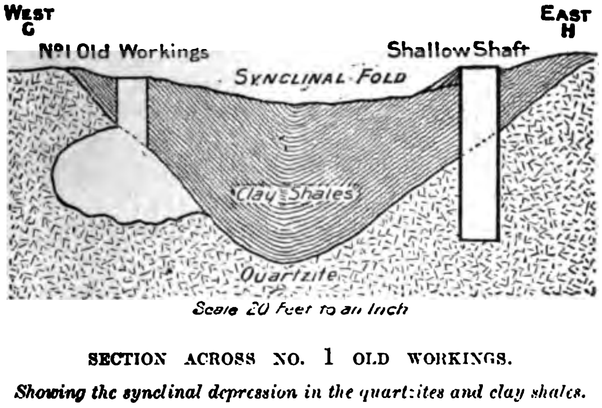
MINING DEVELOPMENTS.

The surface workings at Mount Chalmers were started about rty years ago, when the outcrops of gold-bearing quartzite and ›ssan near the adit level were opened up. Since that time there has ›en a considerable amount of prospecting work carried on in many ırts of the property.

The portion of the workings referred to herein as No. 1 Old 'orkings comprises shallow shafts, open-cuts, trenches and irregular :cavations in ferruginous quartzite, all of which have been worked for ›ld. The stone appears to have been mineral-bearing, but all the ılphides have disappeared, and the gold has been left behind without .e presence of even a trace of copper.

The quartzites and the overlying shales are exposed in a cross- ction in these old workings, the synclinal depression or fold, with a ›rth and south axis and a sharp inclination from the east and west, ›ing well shown. A section of the No. 1 Old Workings is shown in ig. 4.

Fig. 4.



SECTION ACROSS NO. 1 OLD WORKINGS.

Showing the synclinal depression in the quartzites and clay shales.

In the compact quartzites to the east of No. 1 Old Workings ıere occurs a belt of ferruginous rock several feet wide, evidently ıce very much mineralised. This has been worked in an open-cut, ıd several tons of stone, said to contain from four dwts. to fourteen wts. of gold per ton, have been removed and crushed in a local battery. The open-cut extends south-easterly across the mouth of the Adit Level to an old underlie shaft, now covered up, the shaft being connected with the stopes in the eastern workings. A large quantity of oxidised stone from the stopes to the east of this old shaft was treated for gold many years ago, but the yields at that time were not sufficiently satisfactory to warrant the work being continued without cheaper methods of mining and milling, although the gold-bearing stone removed must have had a width of several feet. Plate 3 shows the position of the open-cut, the stopes, and the old covered-up shaft.

The workings at the bottom of the East Shaft, and also those connected with this shaft below this level, have been worked for copper, and the ramifications therein show that the cupriferous quartzites, while occurring irregularly, have been sufficiently rich to pay for costly mining. There is a large body of semi-oxidised stone exposed here which should yield a considerable amount of payable copper ore, and from the appearance of the various working faces it is evident that the body of stone continues further north-east and south-east.

Fig. 3, page 12, represents a section of the East Shaft Workings, showing the relation of the copper lode to the associated rocks and the probable upward extension of the lode to the surface near the mouth of the Adit Level. Its limit at the fault-plane in the 75-foot Level from "A" Shaft is also indicated in the figure, this level, at its eastern extension, forming the bottom workings of the East Shaft.

The drive connecting the "A" Shaft workings at the 75-foot Level with the East Shaft lower workings is partly closed with débris from the East Shaft stopes, but sufficient is exposed to indicate that the copper gradually disappears from the quartzites as they extend westerly

A small vein of black copper oxide has been followed along the north-western drive from "A" Shaft, and in the same drive (*see* Plate 3) a short "rise" has been put up to follow some partly-oxidised copper ore. The northern drive has passed through a large body of poor quartzites, and is evidently in the same series of quartzites which are exposed at the open-cut near the mouth of the Adit Level.

The Adit Level has been driven in an irregularly northern direction for 320 feet, and has passed through a large body of ferruginous quartzites carrying small quantities of gold. Near the mouth of the tunnel the rocks on one side contain a little copper ore, which, as stated previously, is evidently an upward extension of the copper-bearing lode in the eastern workings.

The cross-cut put in to the east at 195 feet from the mouth of the tunnel, known as the "Ballroom," has been proved to contain payable stone, and 265 tons removed from the chamber at the end of the cross-cut have been treated, it is said, for a return of nine dwts. per ton. The stone exposed in this part of the mine contains gold varying from two to seven dwts. per ton, but this did not offer sufficient inducement, under the old conditions, for continuing the work.

The cross-cut on the west side of the Adit Level is in lode material similar to that found in the "Ballroom," but it also contains a red jasper, with carbonate of barium (Witherite), sulphate of barium (Barytes), and carbonate of lead (Cerussite). Assays which have been made prove that the stone in this cross-cut contains traces of gold and from six to seven ounces of silver per ton.

The winze at the end of the western cross-cut on the boundary of the ore body has been sunk to a depth of forty feet, and has revealed a tendency of the wall of clay shales to change from a steep angle of inclination to one comparatively flat. This is illustrated in the section on Plate 5. The wall in the vicinity of the winze is probably undulating, and so both steep and flat portions may be expected to occur alternately.

Along the Adit Level beyond the cross-cuts, the ferruginous quartzites have been proved to continue uninterruptedly. Assays which have been made of samples taken from every portion of the drive between the "Ballroom" cross-cut and the eastern cross-cut opposite the North Shaft, a distance of sixty-six feet, and also of samples from the latter cross-cut itself, average, according to the management, three dwts. of gold to the ton, and traces of silver. The cross-cut also exposes copper ore, but in negligible quantities and values.

The quartzites in the western cross-cut—*i.e.*, between the eastern cross-cut and the North Shaft (*see* Plate 3)—have been tested by a bulk sample, and five tons which was sent to Ballarat by Captain Osborne, yielded five dwts. of gold per ton.

The Adit Level is extended further north of the last-mentioned cross-cuts, and after passing through about forty feet of quartzites, and meeting with a wall of clay shales, is then continued to the north-east and then to the east, keeping the wall on its northern side, the total distance from the last-mentioned cross-cuts being about eighty feet. No data are obtainable showing the results of any tests of the stone from this end of the Adit Level.

The shale wall exposed at the northern end of the Adit Level trends towards the south-west, and, as shown in Plate 3, probably junctions with the wall found close to the North Shaft and also found in the winze further south. The dip of the shales at the northern end is at an angle of sixty degrees to the north, but while the direction of dip varies as the direction of trend or strike, the angles of dip observed in this level are found to be fairly uniform.

The North Shaft has been sunk to prospect the sulphide ore-bodies at the northern end of the mine, and has reached a depth of 220 feet. The Adit Level is forty-five feet from the surface, below which there is No. 1 Level at 120 feet, No. 2 Level at 150 feet, the Intermediate Level at 182 feet, and No. 3 Level at 204 feet. All the levels are connected with the North Shaft, and with the exception of the Adit Level, all are driven into sulphide ore containing copper and gold. The position of the shafts with regard to the levels are shown in plan on Plate 3 and in section on Plates 4 and 5.

No. 1 Level, at 120 feet below the collar of North Shaft, has exposed a large body of ore in the workings, most of which consists of iron pyrites in quartzite, with associated quartz veins and red jasper masses. The copper contents of portions of the ore tested at this level

Fig. 3 illustrates the workings on No. 1 Level, and, as well as the features referred to above, shows the position of the cross-cut from the western drive. At the end of this cross-cut, a change in the character of the lode took place, and what was thought to be a wall was met with, but which, however, is only a portion of a shale formation, and apparently included in the sulphide ore body as a "horse." The stope in the south-eastern drive where the native copper was taken from is also shown in the figure.

No. 2 Level, at 150 feet below the surface at the North Shaft, has been extended from the shaft in two directions, one drive being south-easterly, the other northerly. The south-eastern drive is, altogether, ninety feet long—the first forty feet being to the east-south-east from the shaft and then fifty feet to the south-east, and having a thirty-foot cross-cut to the north-east at about twenty feet from the face. These workings have exposed a body of quartzites and sulphide ore having a general average value of 4·5 per cent. of copper, with about two dwts. of gold per ton, and one ounce of silver per ton. These results are from the many recorded assays of the stone which have been made at various times.

In the northern drive between the North Shaft and the intersection of the eastern and western cross-cuts, a distance of 190 feet, the ore is sulphides and quartzites, being siliceous and partly oxidised near the shaft, and gradually becoming more basic and showing less decomposition towards the northern end of the workings. The general average assay returns of samples taken throughout this 190 feet show that there is a body of ore here which probably contains 3·15 per cent. of copper, 3 dwts. 7 grs. of gold per ton, and 11 dwts. 3 grs. of silver per ton.

The Western Cross-cut is twenty feet long and the sulphides exposed in it extend westerly to the clay shale wall. A dyke, irregularly traversing the ore in the cross-cut, passes into the clay shales beyond the wall, and being of later formation than the sulphides cannot be expected to have any influence on their richness.

The northern drive has been continued north of the intersection of the cross-cuts, and passed through a small clay dyke at thirty feet, meeting a wall at forty feet. The wall is probably a continuation of that met with in the western cross-cut, and the dyke is assumed to be the same as that penetrated at about forty feet in the eastern cross-cut. The latter cross-cut has been continued in ore on the eastern side of the clay dyke, where, at seventy-five feet, a clay shale wall was met with which has a south-east trend. The drive was then turned in the latter direction and followed the wall up to a break or fault which crosses the country and the ore body in an east-and-west direction. This break seems to be the same as that found in the main drive about forty feet south of the intersection of the cross-cuts, and as the clay dyke is present at both places, probably it will be found to traverse both the ore body and the country from east to west on the line of fault. These features are shown in plan on Plate 3 and in greater detail on Plate 7.

The gold, silver, and copper contents of the sulphides occurring throughout the eastern and western cross-cuts, and also in the end of the main level north of the intersection of the cross-cuts, have been estimated from a great number of recorded bulk and test sample assays, the general average values being as follows:—

Copper, 5·07 per cent.; *gold*, 8 dwts. 16 grs. per ton; *silver*, 11 dwts. 13 grs. per ton.

The large number of bulk assays which have been made by the management of stone taken from this level indicate, as in the results from other parts of the mine, a remarkable evenness of grade, while test samples which have been stripped by several independent mineral surveyors very closely agree with those bulk assays. All the returns have been averaged, and the results are as quoted above.

The Intermediate Level at 182 feet has been opened out to the north-west and south-east of the North Shaft, and has exposed sulphide ore from one end to the other, the distance between the north-western and south-eastern extremities being about eighty feet. Concerning the north-western workings, the level is driven twenty-eight feet to the north-west, then twenty feet west-south-west, quartzites and sulphide ore with included masses of chloritic rock being met with throughout. To the south-east from the shaft, a level twenty-eight feet long connects with the No. 1 Winze, traversing quartzites containing sulphides.

No. 3 Level, at a depth of 204 feet from the surface, has further developed the body of sulphide ore, but the drives show that the values have not improved at this depth, the ore being slightly poorer in copper and gold than the ore in the Intermediate Level above.

From the North Shaft a drive twenty-three feet long has been put in towards the west, and a cross-cut from this drive at five feet from the shaft has been extended forty-five feet in a direction slightly west-of-north. On the other side of the shaft there is a drive thirteen feet long, having an east-north-east direction, from which there is a small easterly extension twenty-nine feet long. At the end of this extension a sixteen-foot drive has been put in to the north-east, and an opposite one to the west-south-west for a distance of about twenty feet.

The western drive, and the northern cross-cut from it, have exposed compact sulphides having a comparatively small proportion of quartzites, while in the eastern and southern workings the proportion of quartzites to sulphides is found to be greater.

The values of the ore in No. 3 Level, ascertained by the numerous samplings from the North Cross-cut, the West Drive, the East Drive, the Magazine Drive, and the drive opposite the latter workings, are as follows:—

Copper, 1·69 per cent.; *gold*, 20 grains per ton; *silver*, 15 dwt. 7 gr. per ton.

The averages are representative of the whole of the ore exposed in the level, except the south-eastern extension of the East Drive which ends at the No. 1 Winze, and the drive west-south-west from No. 1 Winze, the ore in both these two workings being very poor. (*See* Plate 9.)

The Western Workings have exposed a series of shale beds quite distinct from the massive quartzites which outcrop further east, and which contain sulphides of copper, iron, and zinc, with carbonate and sulphate of barium. The Windlass Shaft has been sunk to a depth of sixty feet, the upper portion being in clay shales, the lower portion in barium-bearing shales. The latter were followed along the strike for 100 feet (?) in a northerly drive towards the West Shaft, but on account of the drive being filled with mullock taken from the adjoining cross-cut an examination could not be made. This cross-cut has been driven sixty feet to the west, and after passing through a series of clay shales entered a bed of quartzite containing traces of gold and copper.

About thirty feet to the west of the Windlass Shaft the "Red" Shaft has been sunk to a depth of sixty feet (?) but has been filled up to about thirty feet, the two shafts being connected by old underground workings. In these old workings some ferruginous gold-bearing clayey ore is exposed, and from the manner in which portions of it have been selected and removed, while other parts have been discarded, it is evident that some of the ore has been of a payable grade. The bright-red colour given to the ore by the oxide of iron (haematite) has suggested the name by which this shaft is known.

There are other workings about forty feet south of the Windlass Shaft, consisting of an open-cut and shallow excavations, where the reddish shales and quartzites are seen close to one another, both with a defined easterly dip. The quartzites exposed do not contain a payable quantity of gold, and this is probably the reason why so very little work has been expended on them, while the shales which contain sulphide of zinc, lead, and copper have been also neglected because they do not contain high values.

The easterly dip of the rocks observed in some of the western workings does not appear to be constant, and in the filled-in level of the Windlass Shaft the inclination of the rock is said to be distinctly westerly. Possibly there has been some confusion in observing the angle of dip of the shales and of the cleavage planes in the shales in this level, and the beds might be found to have a general inclination to the east, and thus to underlie the massive quartzites in that direction. If this be true, then the direction of dip would be contrary to that shown in the section of the western workings on Plate 5. The effect in the latter case would necessitate the clay shales in the synclinal fold being shown as an outcrop to the east of the West Shaft, and also to the south-east and south of the large outcrop of quartzite between the western workings and the No. 1 Old Workings.

A casual examination of the rock outcrops in the vicinity of the mine show that the dolerite occurs between the West Shaft and the dam further west, and extends southerly to the hill close to the manathe western workings about the Windlass Shaft, are all comprised in the general term "surface workings." They expose many thousands of tons of stone carrying gold in quantities ranging from three to six dwts. per ton, and this amount would probably be increased by many more thousands of tons if additional prospecting work were taken in hand.

The East Shaft lower workings, from which many hundreds of tons of copper-gold ore have been removed, show evidence of the continuation of the copper lode towards the east, and with the stone now in sight on the numerous faces, it is reasonable to assume that a large number of tons of ore will be available for smelting in future. Its extension in depth will probably be limited by the fault-plane met with at the bottom workings extending easterly from "A" Shaft.

The "A" Shaft workings at the Seventy-foot Level have opened up a large block of country, but except in a small way cannot be considered a source of copper ores or of gold-bearing quartzites. The copper ore and the auriferous quartzites which have been removed at odd times only amounts to a few tons, while a very limited number of tons of each are actually in sight.

West Shaft workings have produced some irregular bunches of good ore, made up mostly of sulphides, and they may be expected to continue this irregular production if work here is started again. An estimate of quantities and values cannot be made, as the occurrence of the ore is too ill-defined.

In considering the quantities and values of the ore in and below No. 1 Level, the Plans and Sections on Plates 3, 4, 5, 6, 7, 8, and 9 are requisitioned. In the vicinity of the North Shaft the levels, cross-cuts, and winzes fairly indicate the existence of a body of ore from about forty feet above No. 1 Level to about ten feet below No. 3 Level, the dimensions being 130 feet in depth, eighty feet in width (north-and-south) and ninety feet in length (east-and-west), and containing 1,026,000 cubic feet. Allowing eleven cubic feet to the ton of ore in this block (the ore consisting of about seventy per cent. of the lighter substances, as silica, alumina, lime, and magnesia), the quantity would be over 93,000 tons.

The values in each level in this (No. 1) Block have been given previously, an average of which shows that the 95,000 tons contain 3·4 per cent. of copper, 1 dwt. 13 gr. of gold per ton, and 16 dwt. 6 gr. of silver per ton.

The ore bodies in the northern workings are divided into Blocks No. 2 and No. 3, respectively being above and below No. 2 Level. The ore between No. 1 and No. 2 Levels, it is reasonable to suppose, continues horizontally for some distance in a northerly direction, but if a gradual downward slope of the ore-body from above No. 1 Level to the northern end of No. 2 Level be taken as the uppermost limit of Block No. 2, there will be no possibility of over-estimation. This slope, together with the vertical distance from the point above No. 1 Level down to the No. 2 Level, and the horizontal distance from a point thirty feet north of the shaft (the northern limit of No. 1 Block) to the northern end of No. 2 Level, will be the triangular sides of what might be expected to be its minimum area in a north-and-south vertical section. The position of these Blocks are shown in red on Plates 3, 4, and 5.

The east-and-west section of Block 2 is taken at the points where the northern vertical face of Block 1 is assumed to be, and the area of this vertical section is a rectangle. The north-and-south triangular area gives an average height of thirty-three feet, the east-and-west rectangular section gives a width of ninety feet, and the distance along No. 2 Level is 165 feet. There are many irregularities to be noticed in defining these limits, and a give-and-take method has had to be adopted, but, all things considered, the dimensions are as near as can be attained in such an approximate estimate. The block contains 490,000 cubic feet, and, having a higher percentage of metallic minerals, and a comparatively low percentage of silica, alumina, lime, and magnesia (under fifty per cent) ten cubic feet is allowed to the ton, from which Block No. 2 is estimated to contain 49,000 tons of ore.

No. 3 Block is contained in the area below No. 2 Block, the lower boundary reaching below No. 3 level, and sloping upwards from this level to the northern end of No. 2 level. It has the same cubic capacity as Block No. 2, and, therefore, is assumed to contain the same number of tons of ore, namely, 49,000 tons.

The tonnage might be considerably augmented by the ore which continues below No. 2 level at the wall in the northern workings, as the inclination of the ore-body there is to the northward. There is some probability, however, of this wall turning under and dipping in the opposite direction, and therefore it has been deemed advisable not to form an estimate of quantities in this part until some more work has been carried out.

Consideration has been given to the occurrence of unpayable portions of the ore-bodies, and to the probability of some of the ore being thrown out as mullock when the mine is in full working order. If one-quarter of the whole of the tonnage be taken as the portion discarded, there would be, of course, an accompanying loss in copper, gold, and silver, but an increased value to that which is selected; and perhaps a sixth of the whole of the values in copper, gold, and silver, might be put down as loss, while the remaining five-sixths of the values would be contained in the remaining three-quarters of the tonnage. On this basis there would be, roughly, 145,000 tons of ore available, containing about 4½ per cent. of copper, about 3½ dwt. of gold per ton, and about one ounce of silver per ton.

FUTURE OPERATIONS.

The geological details which have been worked out during the examination of the mine, and the views which have been expressed concerning the character of the ore deposits as a whole, fairly show the lines along which prospecting operations should be conducted.

The quartzites in the surface workings do not contain copper in appreciable quantities, and their gold and silver contents must be considered to be low, so for the present their development and treatment may be neglected. When the more important parts of the mine have been exploited and smelting works established, then some action should be taken to have the ore-bodies in these workings tested by the continuation of the present shafts, or by sinking additional ones, or perhaps by means of bores. The latter method will probably be found to be quite suitable, as the quartzites are massive and regular in their occurrence, and their mineral contents are not confined, as in a reef, to narrow limits.

An easterly continuation of the "Ballroom" cross-cut in the Adit Level would meet with the wall followed in the northern and north-eastern workings in this level, where the trend of the wall changed from east to south-east, and in being followed will probably be found to change gradually to a southerly direction.

The East Shaft surface workings might be tested by boring, and the same bores will prospect the extension of the copper deposits easterly from this shaft, and will also help to define the deep eastern boundary of the massive sulphides of the northern workings.

The results at the "A" Shaft workings do not offer much inducement for further exploiting the quartzites found there, neither is it advisable at the present juncture to drive to the north-west to connect with the West Shaft, as the prospecting work required between the two workings can be done by boring. When the sulphides to the north are found to continue deeper, the expediency of connecting the two shafts may then be considered, and also the desirability of sinking "A" shaft to a greater depth, and connecting it by levels with the workings in the northern end.

The shaft could be sunk a further depth of 100 or 150 feet to get through the quartzites which have already been prospected in the north-western cross-cut from this shaft, and driving northerly would then be prospecting in unknown country. To connect "A" Shaft with the West Shaft on the present prospects is not warranted.

West Shaft workings should be left alone for the present, but, subsequently, as the northern workings are sunk deeper, and if the sulphides are found to dip persistently to the west, it might be advisable to drive towards those workings and tap the quartzites which cannot be very far away, as shown in Plate 5. Driving westerly from the shaft will reveal new country, as this will be across the strike, while in following to the north the beds which are found in this shaft, probably the trend will be found to gradually change from north to north-east, and then to the eastward. This latter work, however, cannot be recommended at the present time, as it will be outside the boundary of the massive sulphide ore body.

The Windlass Shaft, by being continued to a greater depth, will meet with the quartzites if these rocks are found to dip westerly, and the presence of sulphides here in the shales indicates that if the probability of meeting with country rock until the eastern wall is penetrated, which must be about 200 feet away. These features will be better understood by referring to the sections on Plates 4 and 5.

In the lower levels, as they are extended, the wall to the west may be found to be less inclined, and in further sinking the North Shaft, which offers certain advantages in being retained as the main working shaft, other levels driven westerly might be extended a great distance without meeting the western wall, as the wall possibly exists there horizontally, or might even be turned up to dip in the opposite (east) direction to form a synclinal fold.

The northern wall exposed at the end of the workings in No. 2 Level shows strong indications of dipping to the north, and it is at this extremity of the ore body that prospecting operations should be carried on vigorously. Probably the vicinity of the intersection of the main level with the two northernmost cross-cuts offers the best position for sinking a winze to prove the continuation of the sulphides below, while other favourable spots for sinking are along these two northern cross-cuts. The eastern extension of the cross-cut nearer the shaft should also be carried on to meet the eastern boundary.

Before extending the lower levels in a northerly direction it would be advisable to bore at the northern end of the ore body either from the surface or from the face of No. 2 Level. In the former case the vertical depth to expect to find the ore would probably be greater than the horizontal distance of the site from the North Shaft, as the inclination of the wall is more nearly vertical than horizontal. All the country from the surface to the ore body, being shales, would have to be bored through, and then there would be the chance of missing what was sought, as the wall with its northerly dip might change to a southerly inclination some distance south of the position of the bore.

From No. 2 Level the boring would begin in ore, and a vertical bore should be of immense assistance as a preliminary to driving from the north shaft below No. 2 Level. An inclined bore put down in a northerly direction from the same position would very quickly indicate whether the wall dipping north continued to dip in that direction, or whether it turns under and dips to the south. In the former case the bore would be entirely in ore; in the latter case, after passing through ore for some distance, the bore would pass into the shales known to exist on this boundary. If the wall turned under and dipped southerly, the centre of the ore body would be further south than where it appears to be from present indications, and any information bearing on this point would be useful in modifying proposed developments, even to discarding the North Shaft as the main working shaft. On the other hand, if the northern wall continued to dip northerly, the necessity might arise for putting down another shaft in that direction further on from the "North Shaft."

Reference has repeatedly been made to the syncline exposed at the No. 1 Old Workings, and to the occurrence there of gold-bearing quartzites. A bore put down at a point west of the North Shaft and north of No. 1 Old Workings would define the limits of the ore in that direction, and, although the upper portion of the bore would be in clay shales, the information would be a most useful item in questions concerning future developments.

A bore might also be sunk between the No. 1 Old Workings and the Windlass Shaft, to ascertain if the quartzites in that locality are gold-bearing and, as occurs further north-east, if they are covering a body of sulphide ore. In addition the bore would show if the supposed easterly dip of the western boundary of the quartzites is defined in depth.

To the south-east of the North Shaft a bore in the hard outcrop would give some data concerning the eastern limit of the quartzites, and would probably yield some information about the extension in this direction of the copper lode in the East Shaft workings, and also about the eastern portion of the sulphide ore body in the workings at the North Shaft.

Trenching on the surface to define the dip and strike of the shales surrounding the outcrop of the quartzites is an adjunct to the other methods of prospecting, and is specially applicable to the ore-body at the Fitzroy Mines. The strike and dip of the shales will correspond with the dip and strike of the wall of the ore body, and any marked variation in the direction of the strike and the angle of the dip of the sedimentary rocks will have its corresponding change in the boundary of the ore body. When positions and angles of the dip are known on

During the examination of the Great Fitzroy Mines, some attention was given to the occurrence of small quartz veins occurring in the shales away from the main body. Some of the veins have been trenched, and a small vertical one, found by Messrs. Clancy and Tooker, at a place about eight chains to the north-north-east of the North Shaft (*see* Plate 2) has been exposed for some distance in a tunnel driven for about seventy feet, westerly, through dolerite (?) quartzites and shales. In view of the peculiarities of such veins in the rocks in this locality not being understood, the work which has been done possibly has been justified, but the results have proved very unsatisfactory and there is nothing to warrant the continuation of any further prospecting operations.

METALLURGICAL CONSIDERATIONS.

The old system of working consisted in simply crushing the surface stone in a battery and saving the gold on amalgamated plates, the tailings with the fine gold being allowed to go away without any further treatment. This method was profitable at times, but on the whole the expenditure must have been greater than the receipts, and probably as much gold was lost in the tailings as was saved in the battery.

With the finding of small quantities of sulphides in the oxidised ore, a smelting plant was erected, and a Fraser-and-Chalmers 60-70 ton water-jacket furnace was installed, but proper provision was not made for the supply of ore and the necessary flux, and after running for about two weeks, during which a few hundred tons of ore were smelted, operations ceased and the mine closed down.

A further phase, of recent date, consisted in crushing the semi-oxidised ore in rolls and concentrating it in jigs, the product being shipped to smelting works. The raw sulphides are evidently not amenable to water concentration, and a large quantity of the ore which has been dumped on the surface is now ready for some other treatment. Some experiments have been made in precipitating the copper salts present in the water percolating through the tailings, the precipitation being carried out in launders with scrap iron. The results show that all the copper which has been oxidised to the form of sulphate is removed from the water, but the tailings, which contain, according to the assays made by the management, about two per cent. of copper, retain nearly all the copper as carbonate and as sulphide.

It is now proposed to erect smelting works for the treatment of the sulphide ores containing copper and gold. After that will come the consideration of what is to be done with the quartzites, which are barren of copper and are too siliceous for smelting purposes, and which contain, approximately, four dwts. of gold and about one ounce of silver to the ton.

The cost of quarrying the quartzites might be made very low were operations conducted on a large scale, and if the treatment were to be carried on in conjunction with such other works as might be established in the vicinity, the general expense could be so reduced as to warrant some action being taken.

The simple character of the sulphide ore shows that no complex metallurgical treatment will be requred. Zinc Blende and Galena are present in appreciable quantities in the sulphides occurring in the East Shaft, the Windlass Shaft, and in the West Shaft, all of which, however, are considered by the writer to be outside the main ore body. In the sulphides about the North Shaft the quantity of zinc present does not reach more than one per cent., and sometimes it occurs only in traces. Lead occurs in similarly small quantities, and in only one of the bulk analyses given below is it shown to be present to the extent of even one per cent. The percentage of silica is higher than desirable, and the problem in the treatment of the ore is how to eliminate the excess of this substance, whether to treat it in the furnace by adding additional flux or to remove it by some concentration process prior to smelting.

A microscopic examination of slices of the ore from the mine show that much of the silica and sulphide are too closely associated with one another to be amenable to separation by any mechanical operation, but some portion of it might be treated effectually after fine crushing by some such method as the oil concentration process. Practical experiments, however, would be required to solve the problem of separating the gangue from the mineral.

Five average samples of the sulphide ore were taken from the mine

Bulk sample from along the main northern drive, No. 2 Level, between a point 100 feet north of shaft and the face of the drive at 230 feet:—

Silica (SiO_2)	43·22 per cent.
Iron (Fe)	20·41 ,,
Alumina (Al_2O_3)	3·10 ,,
Lime (CaO)	0·98 ,,
Magnesia (MgO)	1·13 ,,
Copper	3·56 ,,
Lead	0·82 ,,
Zinc	0·78 ,,
Sulphur	22·45 ,,
Gold	2 dwt. 0 gr. per ton
Silver	2 dwt. 14 gr. ,,

Bulk sample from along Eastern and Western Cross-cuts, off the main northern drive, No. 2 Level:—

Silica (SiO_2)	41·87 per cent.
Iron (Fe)	22·06 ,,
Alumina (Al_2O_3)	1·81 ,,
Lime (CaO)	0·84 ,,
Magnesia (MgO)	1·03 ,,
Copper	4·89 ,,
Lead	1·00 ,,
Zinc	0·32 ,,
Sulphur	24·08 ,,
Gold	6 dwt. 14 gr. per ton
Silver	6 dwt. 0 gr. ,,

Bulk sample from all workings in the Intermediate (182 ft.) Level:—

Silica (SiO_2)	61·60 per cent.
Iron (Fe)	11·76 ,,
Alumina (Al_2O_3)	2·76 ,,
Lime (CaO)	0·75 ,,
Magnesia (MgO)	0·53 ,,
Copper	3·21 ,,
Lead	0·48 ,,
Zinc	1·02 ,,
Sulphur	10·48 ,,
Gold	0 dwt. 19 gr. per ton.
Silver	13 dwt. 4 gr. ,,

Bulk sample from all workings in the No. 3 (204 ft.) Level:—

Silica (SiO_2)	69·28 per cent.
Iron (Fe)	8·40 ,,
Alumina (Al_2O_3)	4·78 ,,
Lime (CaO)	0·64 ,,
Magnesia (MgO)	1·18 ,,
Copper	1·73 ,,
Lead	0·34 ,,
Zinc	0·89 ,,
Sulphur	9·28 ,,
Gold	1 dwt. 0 gr. per ton.
Silver	9 dwt. 14 gr. ,,

These results show the ore in the workings around the North Shaft to be very siliceous and comparatively low in iron and sulphur, and that in the ore of the northern workings on No. 2 Level a marked change in the proportion of these substances has taken place

Something might be added concerning the fluxes required in smelting the sulphide ore. The mine, or its environments, cannot produce any stone which would be of any assistance in fluxing, and it will be necessary to depend upon outside sources. Limestone can be obtained at the Quarry Reserve three miles to the south-south-east of Tungamull Railway Station, where the outcrops show that the quantity available might not be very large, but that the quality is all that could be desired, an analysis of a sample showing that it contains 99·4 per cent. of carbonate of lime, and 0·6 per cent. of silica, iron, magnesia, &c.

The Glenmore limestone deposits, on Portions 116 and 117, in the parish of Murchison, county of Livingstone, is about seven chains from the bank of the Fitzroy River, and close to Limestone Creek, and about four miles from Rockhampton. (*See* Plate 1.) The limestone has been used for many years for making lime, the supply being found to be practically inexhaustible, while the quality is similar to that of the Tungamull limestone. From the mines the limestone quarry is about nineteen miles distant, of which twelve miles is traversed by the railway from North Rockhampton to New Zealand Gully. The three-mile road between the former station and Glenmore is across level country, and the quarry could easily be connected up with the railway by a branch line along the bank of the river.

stone there, which is hematite mixed with magnetite, is shown by the following analysis:—

Analysis of Iron Island Ironstone.

Water	0·13	per cent.
Silica	2·51	,,
Alumina	2·95	,,
Iron	64·72	,,
Manganese	...	
Lime	2·85	,,
Magnesia	1·07	,,
Phosphorous	0·065	,,
Titania	...	

Details of the limestone and ironstone deposits in the Central District are given by Mr. Ball in a report issued by the Geological Survey:—*.

The supply of fuel for smelting purposes presents no difficulties whatever. Ipswich and Burrum each produce coke of very good quality for smelting purposes, and some of the Queensland smelting works are being supplied with coke from collieries at these localities.

Analysis of Burrum Coke.

Moisture	0·33	per cent.
Volatile Hydrocarbons	2·40	,,
Fixed Carbon	81·95	,,
Ash	15·32	,,

Analysis of Ipswich Coke.

	Unwashed.	Washed.
Moisture	0·35 per cent.	0·5 per cent.
Volatile Hydrocarbons	0·58 ,,	0·4 ,,
Fixed Carbon	81·09 ,,	85·5 ,,
Ash	17·98 ,,	13·6 ,,

Dawson River coal must also be considered as a future rival of the southern cokes as a fuel for blast furnaces, it being semi-anthracitic in composition, changing very little in burning, is very firm and compact (in certain localities), very low in ash, does not cake or coke, and contains a very high percentage of fixed carbon. The mean of several analyses taken from large bulk samples show the coal to have the following composition, the samples being taken from a seam which is six feet six inches thick and unbroken by any bands of dirt or partings:—

Analysis of Dawson River Coal.

Moisture	2·42	per cent.
Volatile Hydrocarbons	11·59	,,
Fixed Carbon	78·42	,,
Ash	7·52	,,

At present the mines are in a state of development, and are not connected with the railway, but surveys have been made of routes to connect with the Mount Morgan Line and to the Central Line at Westwood and at Herbert's Creek. From the mines to Mount Morgan the distance is about seventy miles, to Westwood about sixty miles, and to Herbert's Creek and Boolburra each about forty miles.

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* On Certain Iron Ore, Manganese Ore, and Limestone Deposits in the Central and Southern Districts of Queensland. -L. C. Ball. By Authority: Brisbane, 1904, page 66 (G.S.Q., Pub. No. 194).

Coal also occurs near the Bluff and Blackwater Railway Stations on the Central Line, the distance of the former being 107 miles from Rockhampton, the latter 119 miles. The Bluff Colliery is now producing a good steam coal which has the following composition:—

Analysis of Bluff Coal.

Moisture	1·4	per cent.
Volatile Hydrocarbons	8·4	,,
Fixed Carbon	79·4	,,
Ash	10·8	,,

The Mammoth Colliery at Blackwater is idle at the present time, but the fine coal seam which has been worked there is somewhat similar to that at the Bluff in composition, but has a greater tendency to coke when being burnt. The Bluff coal is now being made into coke by an admixture with it of a percentage of tar and crude petroleum, the product being very hard and bright and well suited for smelting purposes. This coke, as manufactured in a small furnace at Rockhampton by Mr. Heskett, has the following composition:—

Analysis of Coke made from Bluff Coal.

Moisture	1·17	per cent.
Fixed Carbon	85·47	,,
Ash	13·36	,,

Clay occurs in the northern workings of the Fitzroy Mine, as the decomposition product of the basic dykes referred to previously. A general sample from a four-foot dyke in the eastern cross-cut at the northern end of No. 2 Level shows the clay to be of inferior composition, as seen from the following analysis:—

Analysis of Clay from the Four-foot Dyke, Eastern Drive, No. 2 Level, Fitzroy Mine.

the copper in the ore or the yields from the ore as the result of atment. The matte produced in the smelting (quantity unknown) ntained 34 per cent. of copper, 1 oz. 9 dwt. of gold per ton, and oz. of silver per ton.

The returns from the recent concentration and hand-sorting of e ore by Messrs. Charley and Osborne, show that 1,456 tons of ude ore have been treated since 7th September, 1906, yielding over 0 tons of concentrates and prill ore, for a return of £3,248. The tails below show the concentrates to have a value of about £16 per n, and the original ore, which yielded the concentrates, must have d a value of about £2 per ton, plus the value of the copper, gold, d silver left in the tailings:—

Returns from Concentrates, Etc.

Lot.	Weight.				Copper—per cent.	Gold—per Ton.			Silver—per Ton.			Value.		
	Tons	cwt.	qr.	lb.		Oz.	dwt.	gr.	Oz.	dwt.	gr.	£	s.	*d.*
ot 1	86	13	1	17	18·94*	0	1	12	1	13	0	1,382	14	6§
ot 2	51	9	0	6	18·14*	0	1	21	1	11	0	801	7	6§
ot 3	40	11	0	24	18·16*	0	2	15	1	10	0	637	16	3§
ot 4†	9	0	0	0	14·5*	0	3	0	2	2	0	141	12	0
ot 5‡	12	11	0	4	13·6*	0	2	6	1	10	0	285	0	10
otal Quantity	200	4	2	23		Total Value			..			£3,248	11	1

* From this quantity 1·3 per cent. of copper was deducted before being valued by the smelting orks.

† Lot 4 has been concentrated from 57 tons of crude ore, assaying 3·52 per cent. of copper gr. of gold per ton, and 10 dwt. of silver per ton.

‡ Hand dressed ore.

§ Copper taken at £110 per ton, gold at £4 per ounce, and silver at 2s. 8d. per ounce.

Under "Historical Notes" reference is made to the reported ields from the mine prior to 1896, when the Mount Chalmers Copper ining Company began operations.

HISTORICAL NOTES.

In the year 1860 or thereabouts, a prospector named Hill disovered that gold existed in the ferruginous quartzites close to the ase of the ridges that afterwards became known as Mount Chalmers. With a party of men he removed some tons of stone from the more promising outcrops, and this was crushed in an old ten-head battery t Cawarral, a township four miles to the north-north-east of the mine. The stone is stated to have yielded from fourteen to sixteen dwts. of gold to the ton by battery treatment.

In 1860 or 1861 Chalmers took possession of the property and sunk the East Shaft to its present depth, and stoped out all the payable gold-bearing stone which could be conveniently obtained between the surface and the bottom of the shaft. He also took out the stone to the south of what is now the entrance of the Adit Level, and sunk the old inclined shaft situated about seventy-five feet south of the Adit Level, and now covered over with débris. The yields from the stone taken out of these workings are said to have been fourteen dwts. of gold per ton, the stone being crushed at Chalmers's five-head battery at New Zealand Gully, about a mile from the mine.

About the year 1891, a long time after Chalmers worked the mine, a Sydney company (Messrs. Seaver and Scott) started developing the mine, the work consisting chiefly in driving the Adit Level and in opening up the cross-cut known as the "Ballroom." From the latter workings 265 tons of stone were crushed in a ten-head battery erected at the mine by Messrs. Burns and Twigg, of Rockhampton, but the estimated yield of nine dwts. of gold per ton was not realised, and the mine again closed down, after which Messrs. Burns and Twigg, themselves, crushed about 100 tons of ore. The battery after remaining idle for two or three years was removed to Struck Oil, near Mount Morgan, and subsequently to Black Ridge, near Clermont.

Some time afterwards, the date uncertain, Messrs. Murray and a'Court sank a winze to a depth of twenty-nine feet at a position 250 feet in from the mouth of the Adit Level, and the same party also sank a shallow shaft, twenty feet deep, about 480 feet to the southward of the mouth of the Adit Level. The winze afterwards developed into the main shaft, now known as the North Shaft, and the shallow standing all these operations they only smelted 432 tons of five per cent. copper ore. Captain Nicolas was in charge of the mine during this period.

Between the years 1901 and 1903 the Fitzroy Copper Company (an English-Australian company) worked the mine, and continued the West Shaft to 195 feet, its present depth, also putting in the drive at 105 feet, which they proposed extending to "A" shaft. They also drove the long north-westerly drive from "A" shaft.

Between 1901 and 1907 Messrs. Charley and Osborne worked the mine, sinking the North Shaft from the surface to connect with Murray and a'Court's winze below the Adit Level, and continuing it to a depth of 220 feet. They acquired the engines and boilers lying idle at the mine, erected the concentrating plant, extensively prospected the sulphide ore-bodies by driving levels, and brought the mine up to its present excellent condition.

The company now controlling operations is called the "Great Fitzroy Gold and Copper Mines, Limited," having taken possession in May of this year, and with a working capital of £175,000 have started to vigorously develop the property.

Brisbane, July 20th, 1907.

Appendix.

The geological examination of the Great Fitzroy Mine at Mount Chalmers was made at the beginning of May, 1907, and on 30th August advantage was taken of an opportunity which presented itself to make a short visit to the mine for the purpose of inspecting the underground developments which have been carried out since that first examination.

In No. 2 Level, the main north drive has been extended into the country beyond the wall, but only barren rock was encountered. The wall was then followed along its course to the north-east and then to the south-east, the line of demarcation between the country rock and lode being quite distinct. On the eastern wall in this level a lot of work has been performed, including the making of crosscuts, driving along the boundary of the lode, putting up rises, and sinking winzes, the results of which are considered by the management to be most satisfactory. On this level there has been proved, along a line in a north-and-south direction, 350 feet of ore, the southern boundary of the lode not being known, while, altogether, four winzes have been sunk which have proved ore to exist in a solid body down to sixty-five feet below the No. 2 Level. Some of the ore is sufficiently rich to smelt, while other portions it will be necessary to concentrate.

The western boundary of the lode is of inferior grade, but sufficiently rich for concentration purposes. The ore in Block 1 (*see* Plans) has been proved to be, generally, of inferior quality, and by the management has not been included in their estimate of tonnage and values, although portions are undoubtedly of high grade.

Below No. 2 Level a drive has been opened from the North Shaft, at 180 feet from the surface, to meet another began in "A" Shaft, this work being considered advisable on account of getting good ore in the most southern extension of No. 2 Level, and also to afford better facilities for supplying ore to the smelter.

A diamond drill has recently been working on the mine, and these bores were sunk, one on the eastern side of the lode, the other two at the northern end. The eastern bore indicates that the wall retains its easterly inclination, and that the lode continues to dip in this direction. The other bores, at the northern end, have been sunk to indicate the position of the wall at certain depths, and when that information was obtained and the lode tried for a few feet, operations were discontinued. The parts of the lode bored into showed results which the management consider very satisfactory.

Concerning the quantities of ore available it may now be taken for granted that double the quantity of ore mentioned in the body of this report has been proved since the first inspection was made, and

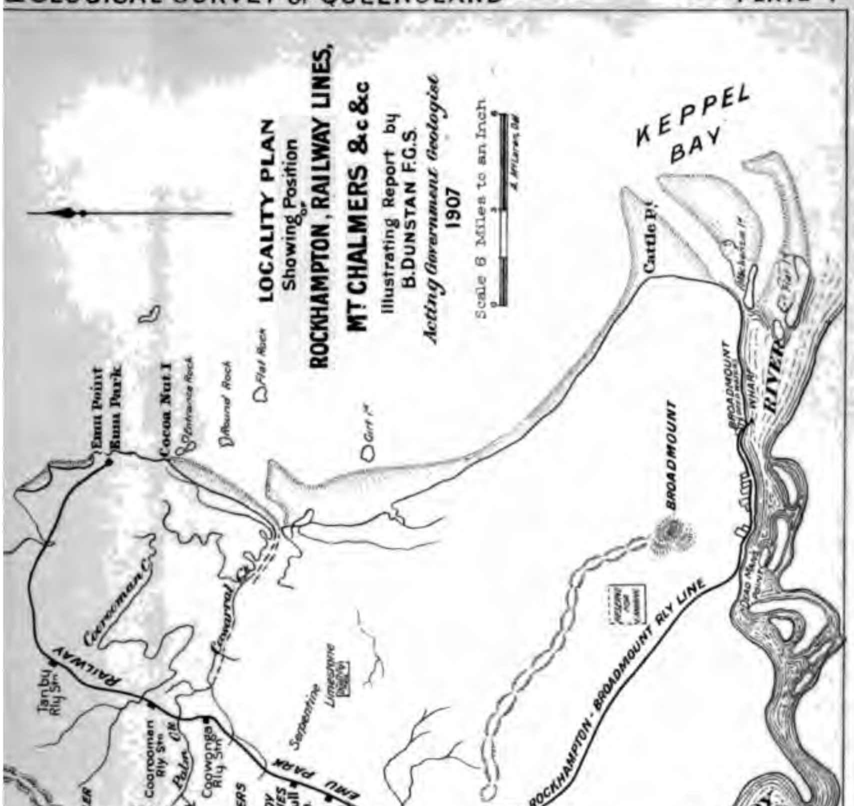
PLATE 1.

LOCALITY PLAN, SHOWING POSITION OF ROCKHAMPTON, RAILWAY LINES, MOUNT CHALMERS, ETC.

The plan is on a scale of six miles to one inch, and shows the position of the Emu Park, Broadmount, and Gladstone railway lines, the Fitzroy River and the Broadmount Wharf, the stations with which a branch line from the Fitzroy Copper Mine would connect, and the locality where the limestone deposits occur at Tungamull and Glenmore.

EOLOGICAL SURVEY OF QUEENSLAND

PLATE I



LOCALITY PLAN
Showing Position of
ROCKHAMPTON, RAILWAY LINES,
MT. CHALMERS &c &c
Illustrating Report by
B. DUNSTAN F.G.S.
Acting Government Geologist
1907

Scale 6 Miles to an Inch

PLATE 2.

Plan showing Topographical Features at Mount Chalmers.

The features are shown in red contour lines, the heights being obtained by aneroid measurements. Rankine Hill, Charley's Hill, and Osborne Hill are prominent features in the vicinity of the Fitzroy Mine, while Mount Chalmers, to the north, towers above them all. The plan is on a scale of four chains to one inch.

PLATE 2

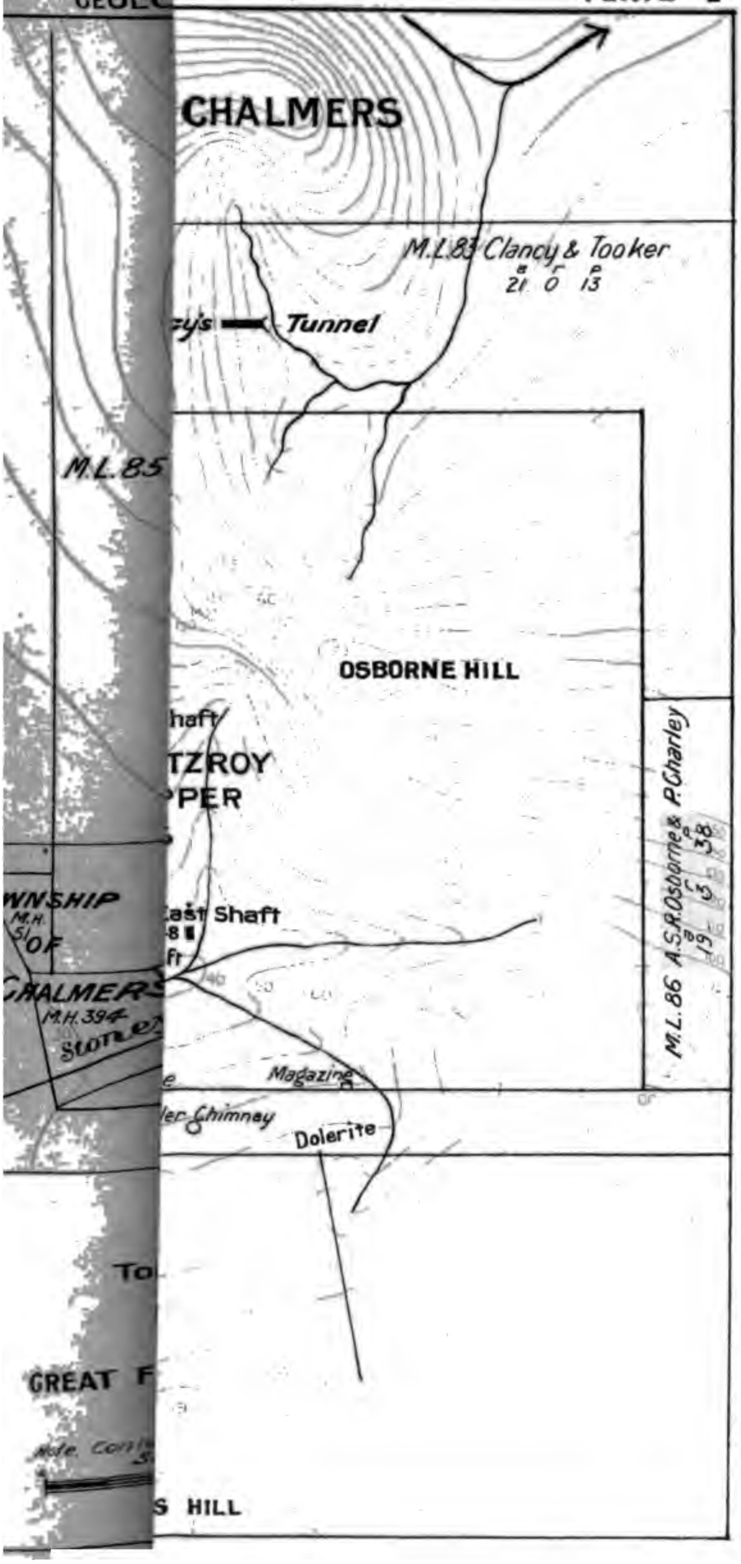
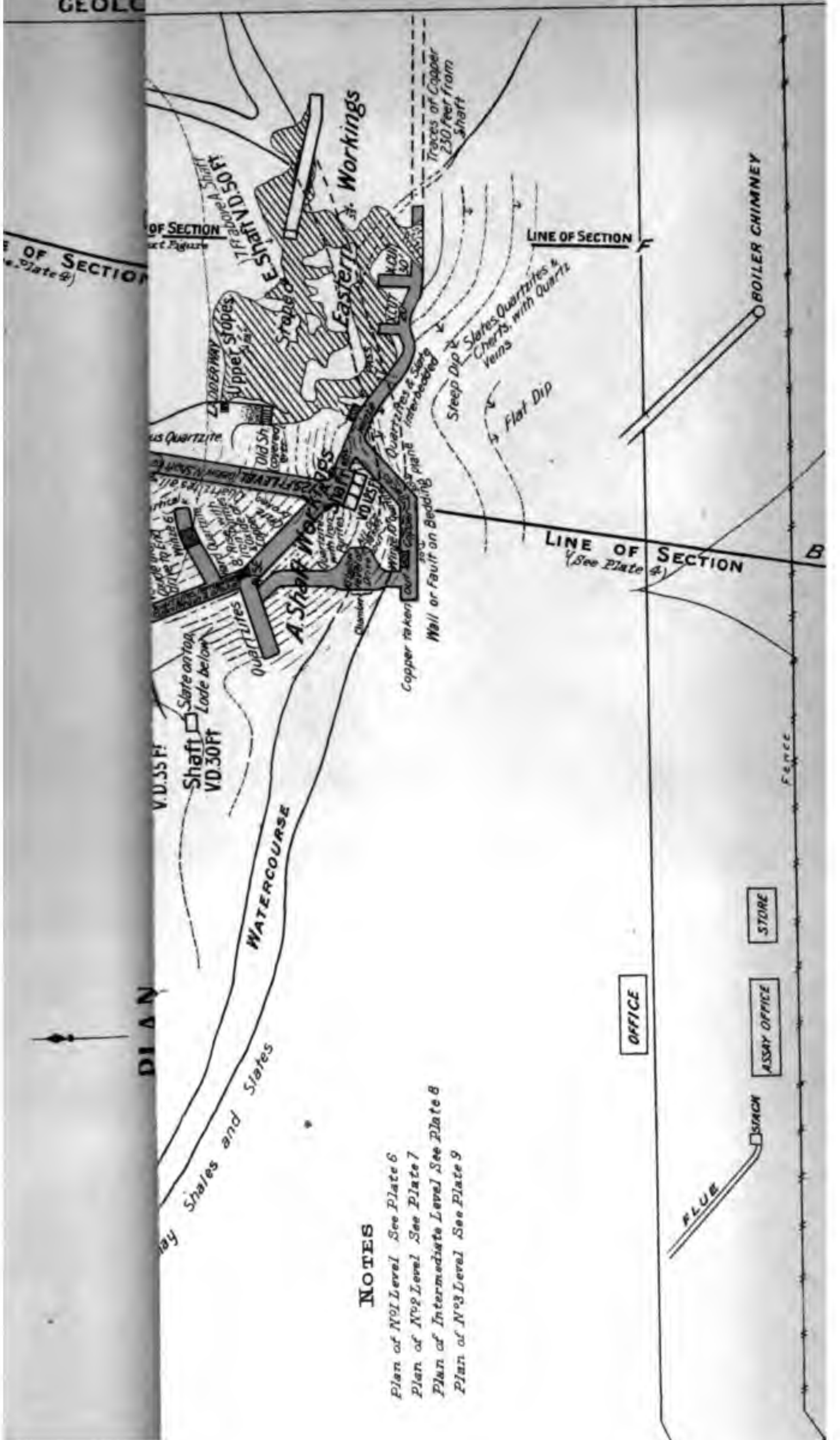

GEOL
CHALMERS
M.L.83 Clancy & Tooker
21 0 13
cy's Tunnel
M.L.85
OSBORNE HILL
haft
TZROY
PER
WNSHIP
M.H. 51
OF
CHALMERS
M.H.394
Stone
East Shaft
ft
Magazine
ler Chimney
Dolerite
M.L.86 A.S.R.Osborne & P.Charley
19 3 38
To
GREAT F
Note. Con
S HILL

PLATE 3.

PLAN OF THE UNDERGROUND WORKINGS OF THE GREAT FITZROY COPPER AND GOLD MINES, MOUNT CHALMERS.

All the developments below the surface are shown on the Plan as well as the position of all the surface workings. Details of the individual levels and of the lines of sections as shown hereon are given on separate plans. The scale of the Plan is eighty feet to one inch.

PLATE 3



NOTES

Plan of No1 Level See Plate 6
Plan of No2 Level See Plate 7
Plan of Intermediate Level See Plate 8
Plan of No3 Level See Plate 9

PLATE 4.

SECTION OF UNDERGROUND WORKINGS ON LINE A.B, SHOWN ON PLATE 3, AT THE GREAT FITZROY COPPER AND GOLD MINES, MOUNT CHALMERS.

The section is a north and south one, and shows the position of the North Shaft, the "A" Shaft, the various levels and winzes, and the underground features in the southern and northern ends of the ore deposit. The scale is eighty feet to one inch.

AT THE
Great Fitzroy Copper-Gold Mines
MOUNT CHALMERS
BY
B. Dunstan F.G.S. Acting Govt Geologist
1907

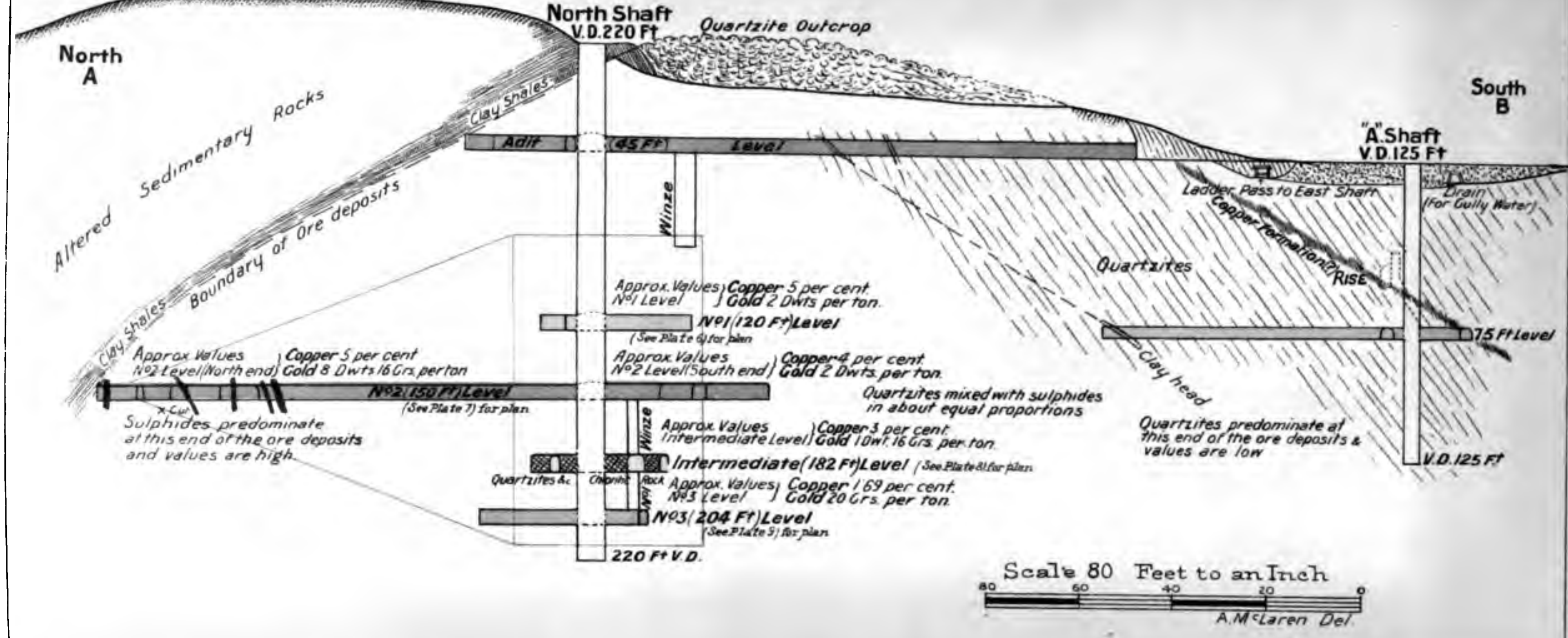

North
A
North Shaft
V.D. 220 Ft
Quartzite Outcrop
South
B
"A" Shaft
V.D. 125 Ft
Altered Sedimentary Rocks
Clay Shales
Boundary of Ore deposits
Clay Shales
Adit
(45 Ft)
Level
Winze
Ladder Pass to East Shaft
Drain (For Gully Water)
Copper formation(?)
Rise
Quartzites
75 Ft Level
Clay head
Approx. Values No1 Level } Copper 5 per cent. Gold 2 Dwts per ton.
No1 (120 Ft) Level
(See Plate 6) for plan
Approx. Values No2 Level (North end) } Copper 5 per cent Gold 8 Dwts 16 Grs. per ton
Approx. Values No2 Level (South end) } Copper 4 per cent. Gold 2 Dwts. per ton.
No2 (150 Ft) Level
(See Plate 7) for plan
X Cut
Sulphides predominate at this end of the ore deposits and values are high
Quartzites mixed with sulphides in about equal proportions
Quartzites predominate at this end of the ore deposits & values are low
V.D. 125 Ft
Approx. Values Intermediate Level } Copper 3 per cent. Gold 1 Dwt. 16 Grs. per ton.
Winze
Intermediate (182 Ft) Level (See Plate 8) for plan
Quartzites &c
Chloritic Rock
Approx. Values No3 Level } Copper 1·69 per cent. Gold 20 Grs. per ton.
Winze
No3 (204 Ft) Level
(See Plate 9) for plan
220 Ft V.D.
Scale 80 Feet to an Inch
80
60
40
20
0
A. McLaren Del.

PLATE 5.

SECTION OF UNDERGROUND WORKINGS ON LINE C.D, SHOWN ON PLATE 3, AT THE GREAT FITZROY COPPER AND GOLD MINES, MOUNT CHALMERS.

The section is taken from east to west, and shows the position of the West Shaft and its underground developments, the North Shaft and all the levels connected with it, and the probable line of junction between the barren country and the ore deposit. The scale is eighty feet to one inch.

SECTION OF UNDERGROUND WORKINGS ON LINE C-D (See PLATE 3)

AT THE

Great Fitzroy Copper-Gold Mines
MOUNT CHALMERS

BY
B. Dunstan, F.G.S. Acting Govt Geologist.
1907

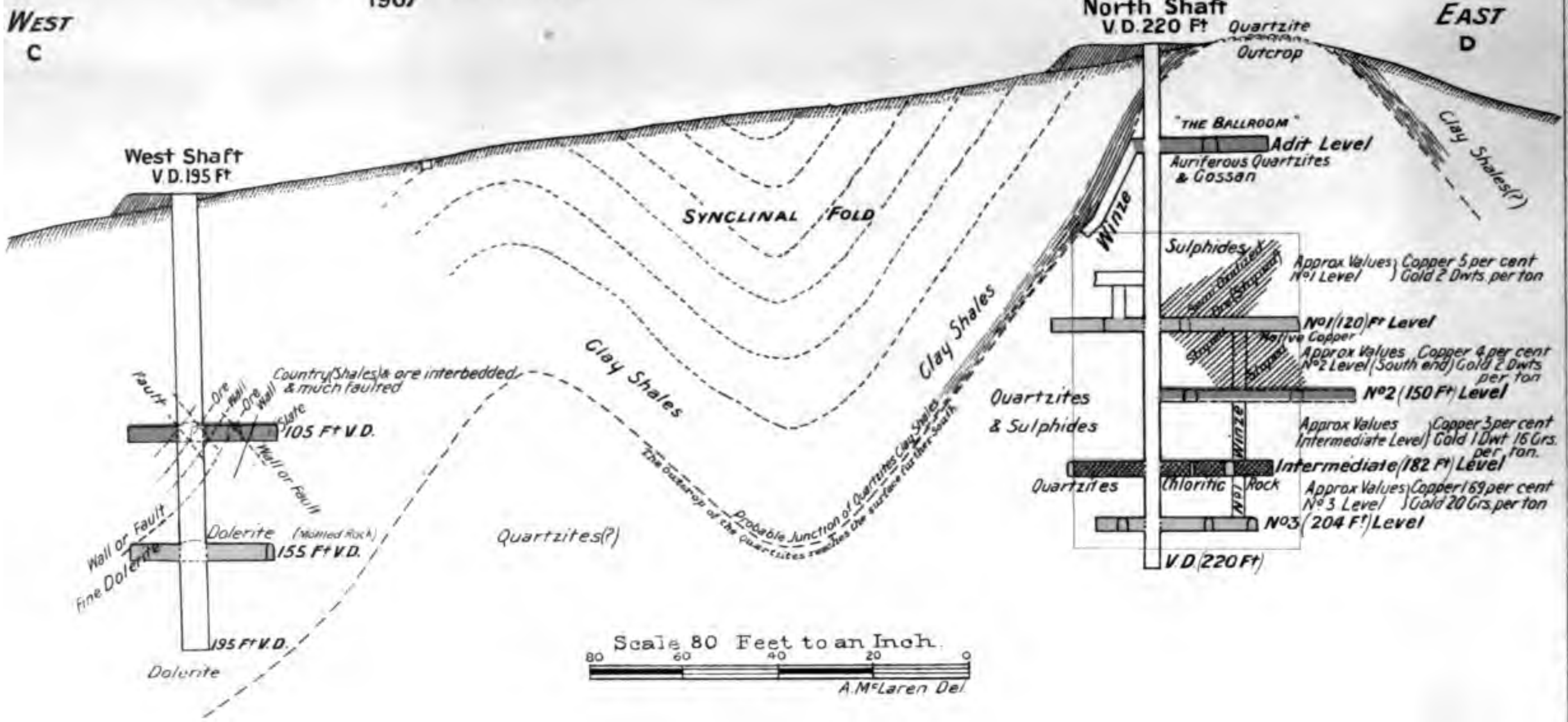
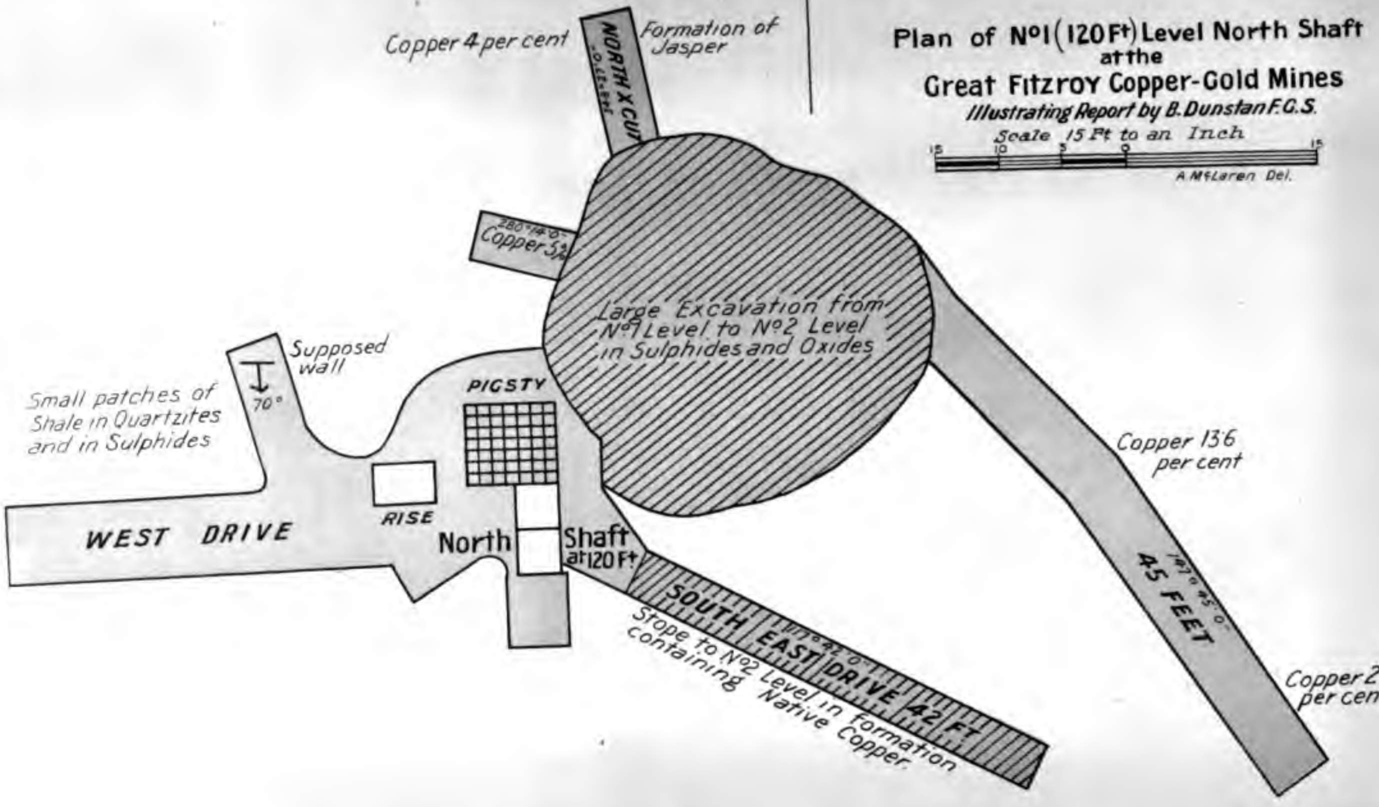

WEST
C
EAST
D
West Shaft
V.D. 195 Ft
North Shaft
V.D. 220 Ft
Quartzite Outcrop
"THE BALLROOM"
Adit Level
Auriferous Quartzites & Gossan
Clay Shales(?)
Winze
SYNCLINAL FOLD
Clay Shales
Clay Shales
Sulphides &
Semi-Oxidized Ore (Stoped)
Approx Values No 1 Level } Copper 5 per cent } Gold 2 Dwts. per ton
No 1 (120) Ft Level
Native Copper
Stoped
Stoped
Approx Values No 2 Level (South end) } Copper 4 per cent } Gold 2 Dwts per ton
No 2 (150 Ft) Level
Winze
Approx Values Intermediate Level } Copper 3 per cent } Gold 1 Dwt 16 Grs. per ton.
Intermediate (182 Ft) Level
Quartzites
Chloritic Rock
No 1
Approx Values No 3 Level } Copper 1.69 per cent } Gold 20 Grs. per ton
No 3 (204 Ft) Level
V.D (220 Ft)
Quartzites & Sulphides
Probable Junction of Quartzites Clay Shales
The Outcrop of the Quartzites reaches the surface further South
Quartzites(?)
Country (Shales) & ore interbedded & much faulted
Fault
Ore
Wall
Ore
Wall
Slate
105 Ft V.D.
Wall or Fault
Wall or Fault
Dolerite
(Mottled Rock)
155 Ft V.D.
Fine Dolerite
195 Ft V.D.
Dolerite
Scale 80 Feet to an Inch.
80
60
40
20
0
A. McLaren Del.

PLATE 6.

PLAN OF No. 1 (120 FT.) LEVEL, NORTH SHAFT, AT THE GREAT FITZROY COPPER AND GOLD MINES.

The large excavation shown in the centre extends both above and below this level, and the two cross-cuts to the north-west are the remnants of drives which were cut away as the excavation was extended laterally. The south-east drive reaches to the level below, and is the locality from where the large quantity of native copper was taken out. The scale of the Plan is fifteen feet to one inch.



Plan of No. 1 (120 Ft) Level North Shaft at the Great Fitzroy Copper-Gold Mines
Illustrating Report by B. Dunstan F.G.S.

Scale 15 Ft to an Inch

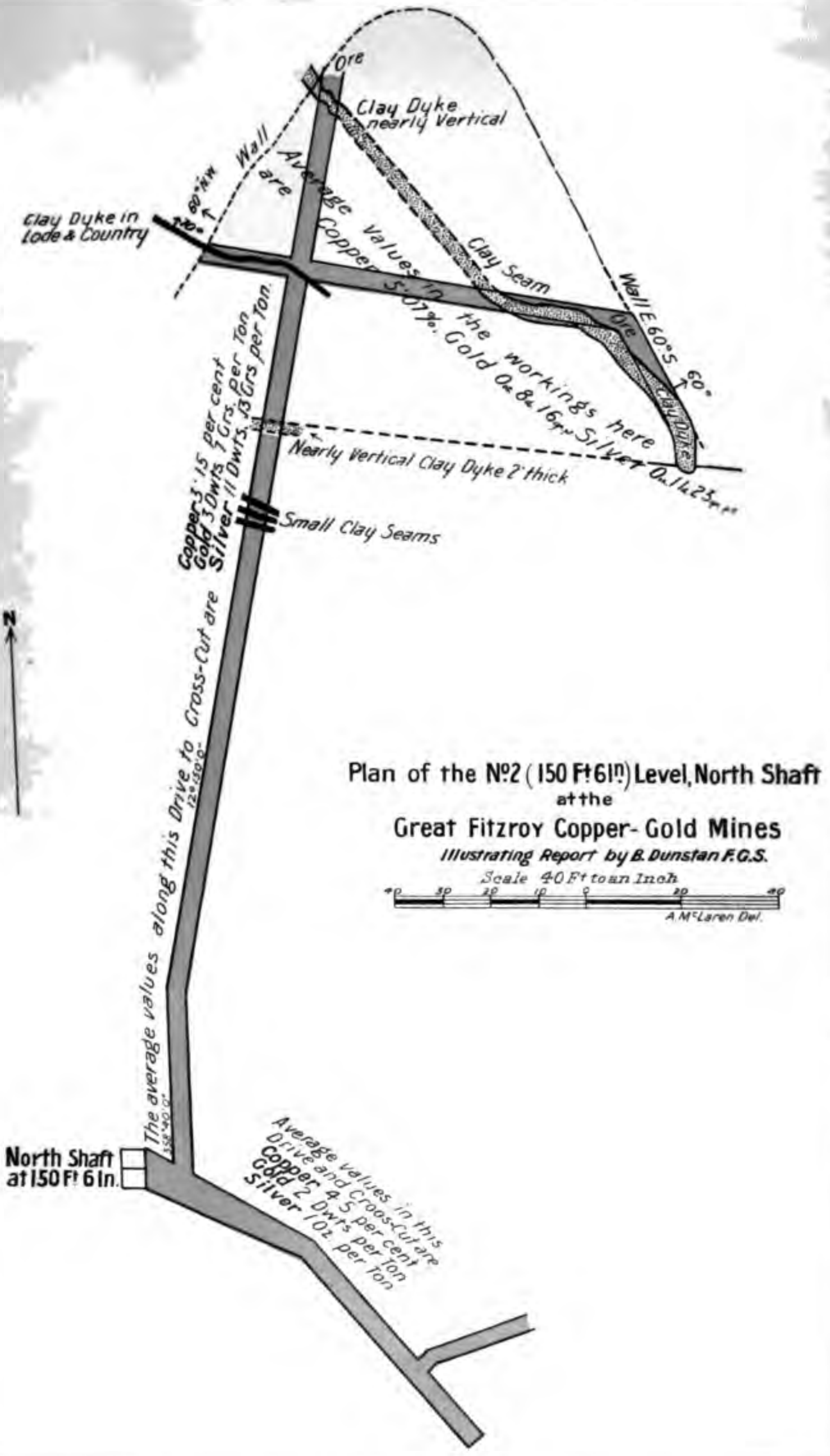
A McLaren Del.

PLATE 7.

PLAN OF THE NO. 2 (150 FT. 6 IN.) LEVEL, NORTH SHAFT, AT THE GREAT FITZROY COPPER AND GOLD MINES, MOUNT CHALMERS.

This is the level in which most of the recent work has been carried out, above and below which developments in future will be undertaken. The boundary wall to the north, which swings around both to the east and west, is unquestionably the limit of the ore deposit in this part of the mine, but a lot of ore might be found to exist immediately below it and towards the south-east, where the eastern boundary wall will probably be found to continue. The clay seams crossing the drives in various directions might prove to be a network of dykes.

The general position of this level is shown in plan on Plate 3, and in sections on Plates 4 and 5. The scale is forty feet to one inch.


Ore
Clay Dyke nearly Vertical
Wall
60° NW
70°
Clay Dyke in Lode & Country
Average values in the workings here are Copper 5·07%. Gold Oz 8 Dwts 16 Grs Silver Oz 14 Dwts 23 Grs
Clay Seam
Wall E. 60° S.
Ore
60°
Clay Dyke
Nearly Vertical Clay Dyke 2' thick
Small Clay Seams
Copper 3·15 per cent
Gold 3 Dwts. 7 Grs. per Ton
Silver 11 Dwts. 13 Grs. per Ton.
The average values along this Drive to Cross-Cut are
12°50'0"
358°40'0"
N
North Shaft at 150 Ft 6 In.
Average values in this Drive and Croos-Cut are
Copper 4.5 per cent
Gold 2 Dwts per Ton
Silver 1 Oz per Ton

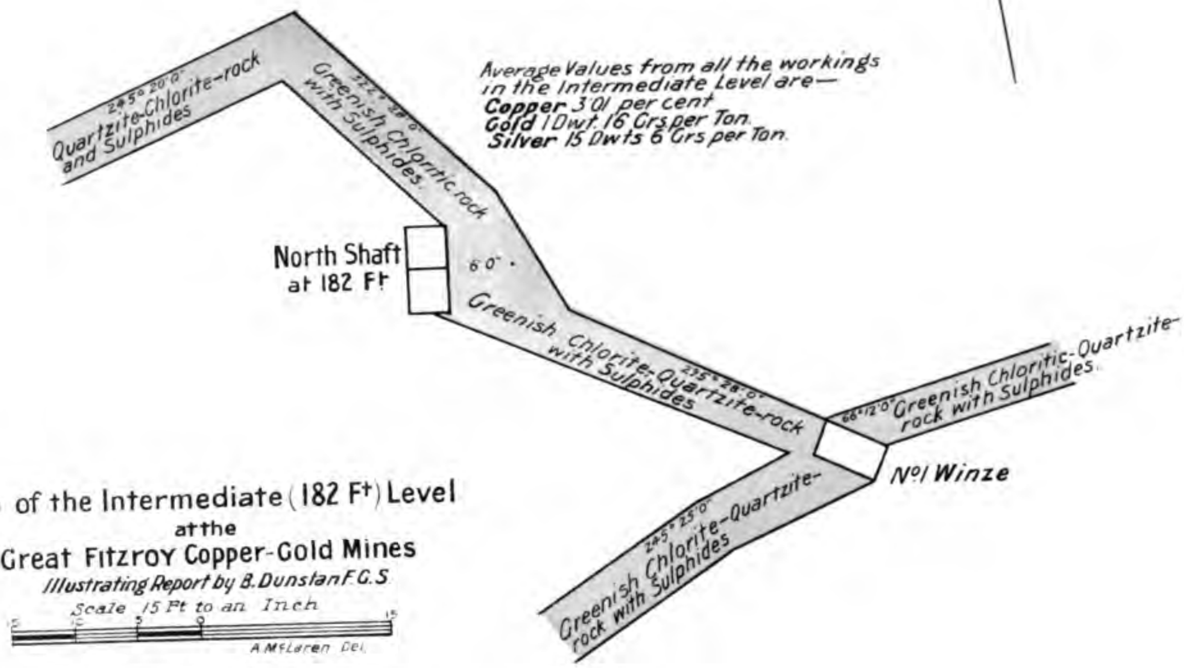
Plan of the No. 2 (150 Ft 6 In.) Level, North Shaft
at the
Great Fitzroy Copper-Gold Mines
Illustrating Report by B. Dunstan F.G.S.
Scale 40 Ft to an Inch
40 30 20 10 0 20 40
A. McLaren Del.

PLATE 8.

PLAN OF THE INTERMEDIATE (182 FT.) LEVEL, NORTH SHAFT, AT THE GREAT FITZROY GOLD AND COPPER MINES, MOUNT CHALMERS.

The developments on this level are limited to workings to the south-east and to the north-west, a greenish chloritic rock being a conspicuous rock in the quartzite and sulphide ore-body.

The general position of this level is shown on Plates 3, 4, and 5. The scale is fifteen feet to one inch.


245° 20'0"
Quartzite-Chlorite-rock and Sulphides
322° 28'0"
Greenish Chloritic rock with Sulphides.
North Shaft at 182 Ft
6'0"
Greenish Chlorite-Quartzite-rock with Sulphides
235° 28'0"
66° 12'0"
Greenish Chloritic-Quartzite-rock with Sulphides.
No 1 Winze
245° 25'0"
Greenish Chlorite-Quartzite-rock with Sulphides
15
10
5
0
15

Average Values from all the workings in the Intermediate Level are—
Copper *3·01 per cent*
Gold *1 Dwt. 16 Grs per Ton.*
Silver *15 Dwts 6 Grs per Ton.*

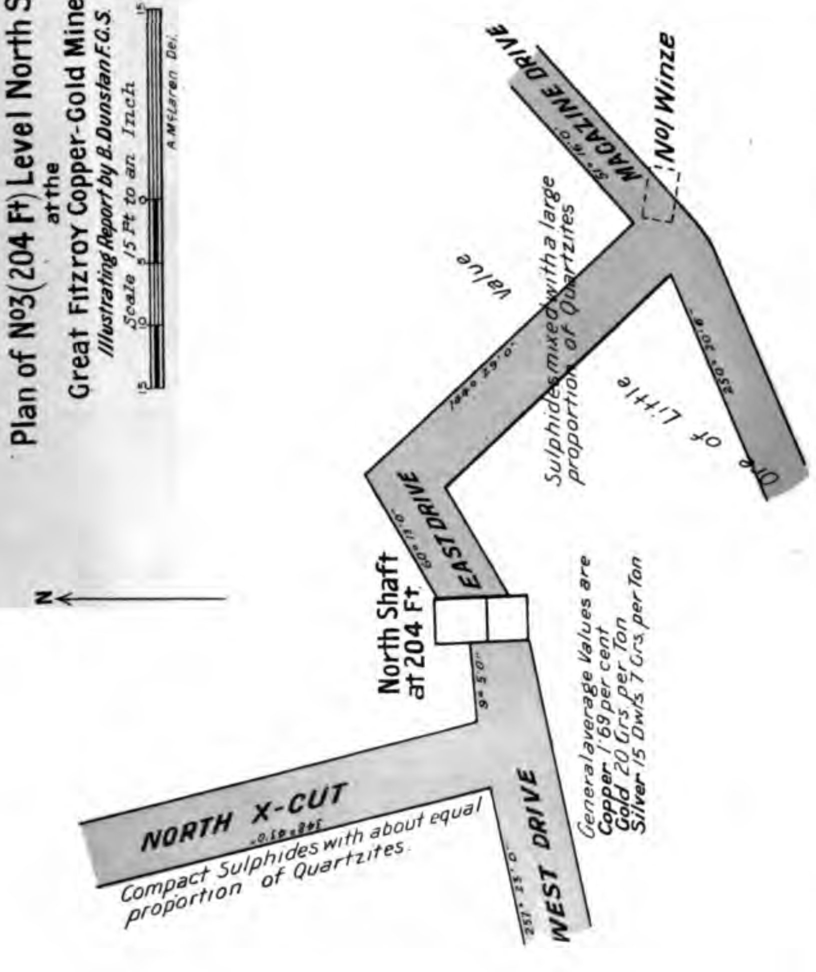
Plan of the Intermediate (182 Ft) Level
at the
Great Fitzroy Copper-Gold Mines
Illustrating Report by B. Dunstan F.G.S.
Scale 15 Ft to an Inch
A. McLaren Del.

PLATE 9.

Plan of No. 3 (204 ft.) Level, North Shaft, at the Great Fitzroy Gold and Copper Mines, Mount Chalmers.

The general position of this level in the mine is shown on Plates 3, 4, and 5.

The scale is fifteen feet to one inch.



Plan of No3 (204 Ft) Level North Shaft
at the
Great Fitzroy Copper-Gold Mines
Illustrating Report by B. Dunstan F.G.S.
Scale 15 Ft to an Inch

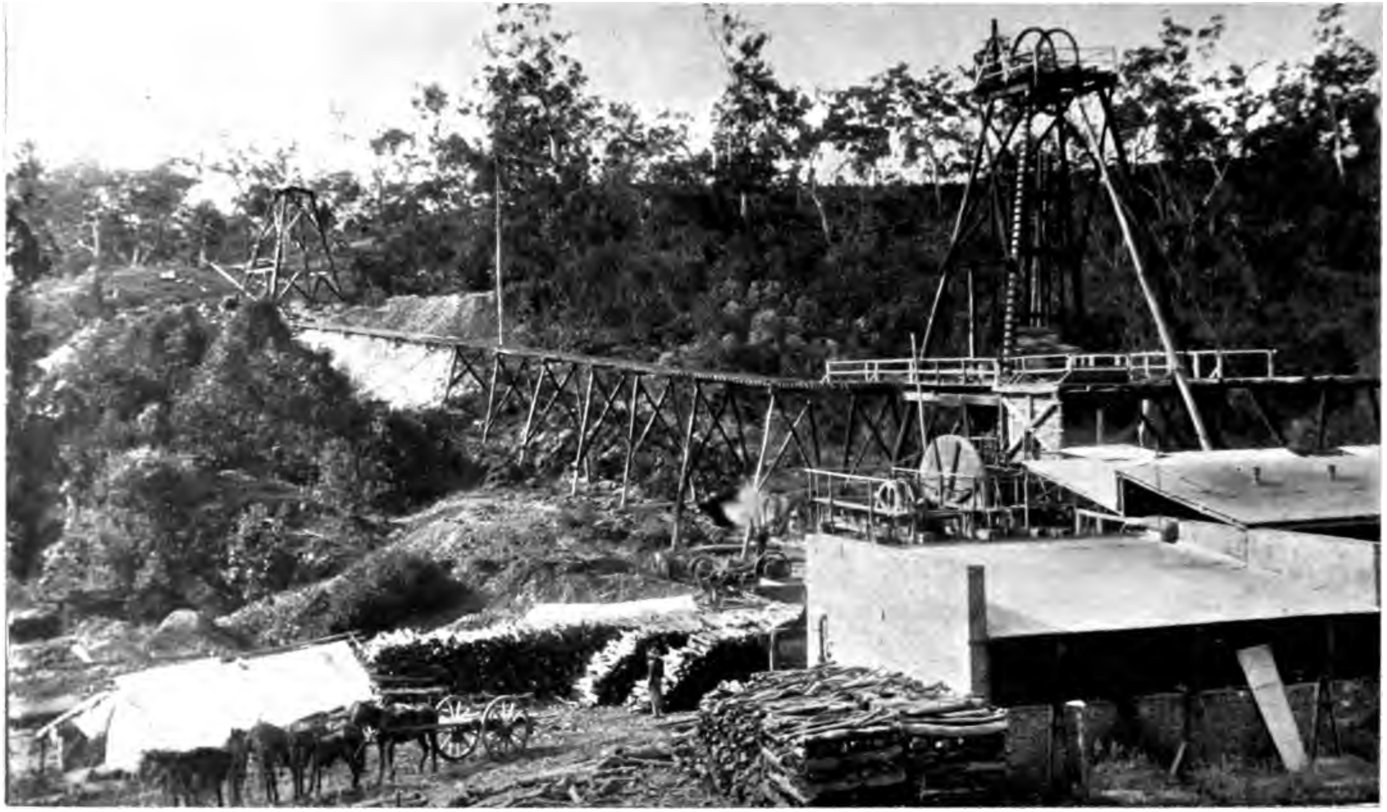
PLATE 10.

VIEW OF THE GREAT FITZROY MINE FROM THE MANAGER'S OFFICE. LOOKING NORTH-EAST.

The engine-house and "A" Shaft are on the right, the No. 1 Old Workings are to the left, partly hidden by trees. The North Shaft is in the background to the left, and the top of Osborne Hill is seen in the background to the right.

Mount Chalmers is in the far distance, to the left.

Plate 10.



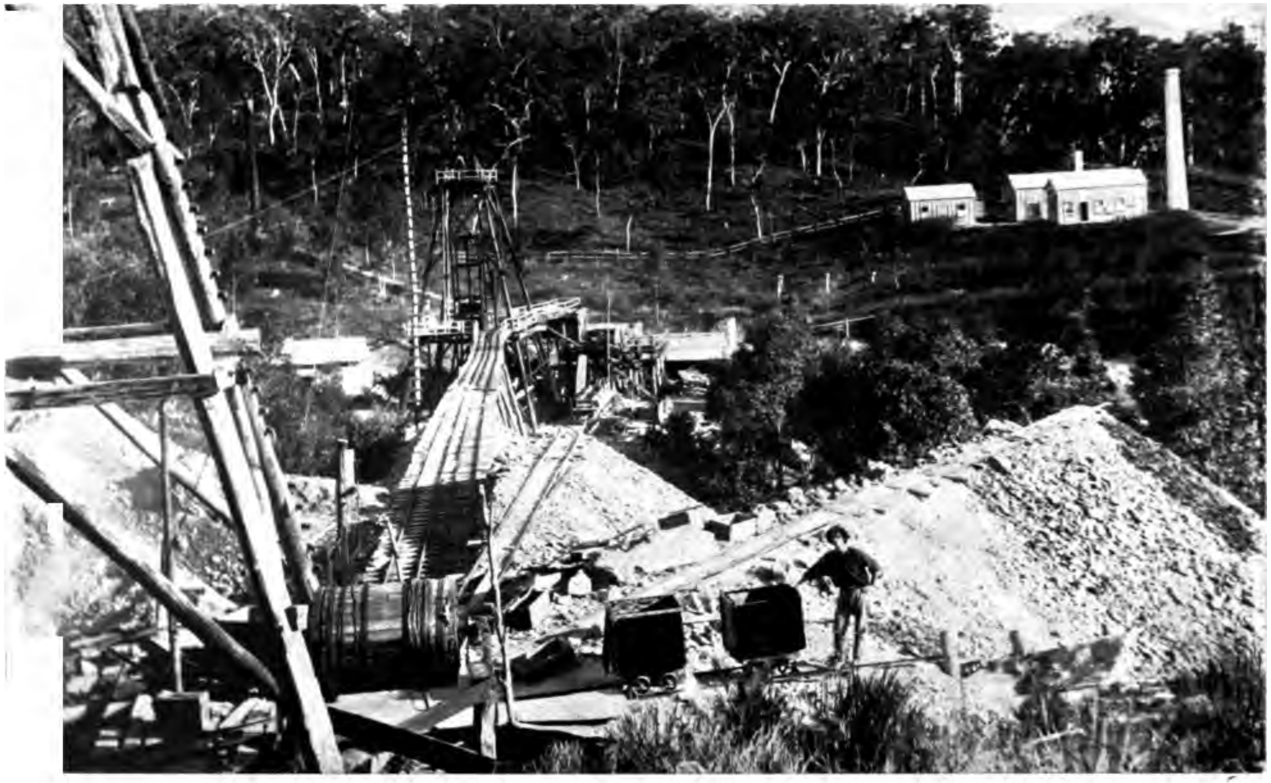
View of the Great Fitzroy Mine from the Manager's Office. Looking North-East. [*Photo. by B. Dunstan.*

PLATE 11.

VIEW OF THE GREAT FITZROY MINE FROM THE "NORTH" SHAFT. LOOKING SOUTH.

The heap of stone to the right is all sulphide ore ready for smelting. The tramway from the North Shaft drops about forty feet on a uniform incline to "A" Shaft in the background. The offices are on the hill in the background to the right. Charley's Hill is in the distance.

Plate 11.



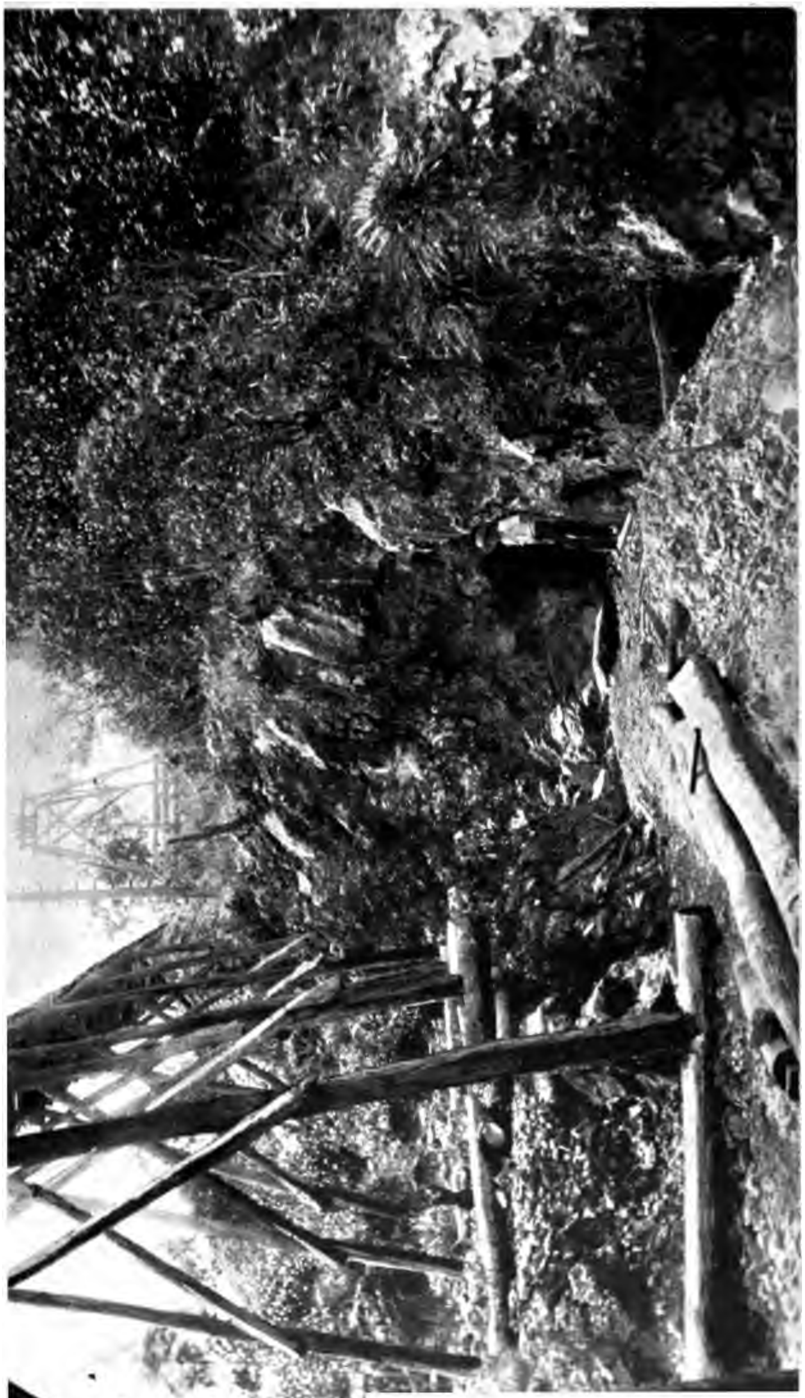
View of the Great Fitzroy Mine from the "North" Shaft. Looking South. [*Photo. by B. Dunstan.*

PLATE 12.

VIEW NEAR MOUTH OF THE ADIT LEVEL, GREAT FITZROY MINE. LOOKING NORTH.

The "Open-cut" extends from the right foreground across the mouth of the Adit Level, then north-westerly under the inclined tramway. The stone from these workings was crushed in a battery many years ago. No 1 Old Workings are to the left, which were also worked many years ago.

Plate 12.



View near Mouth of the Adit Level, Great Fitzroy Mine. Looking North.

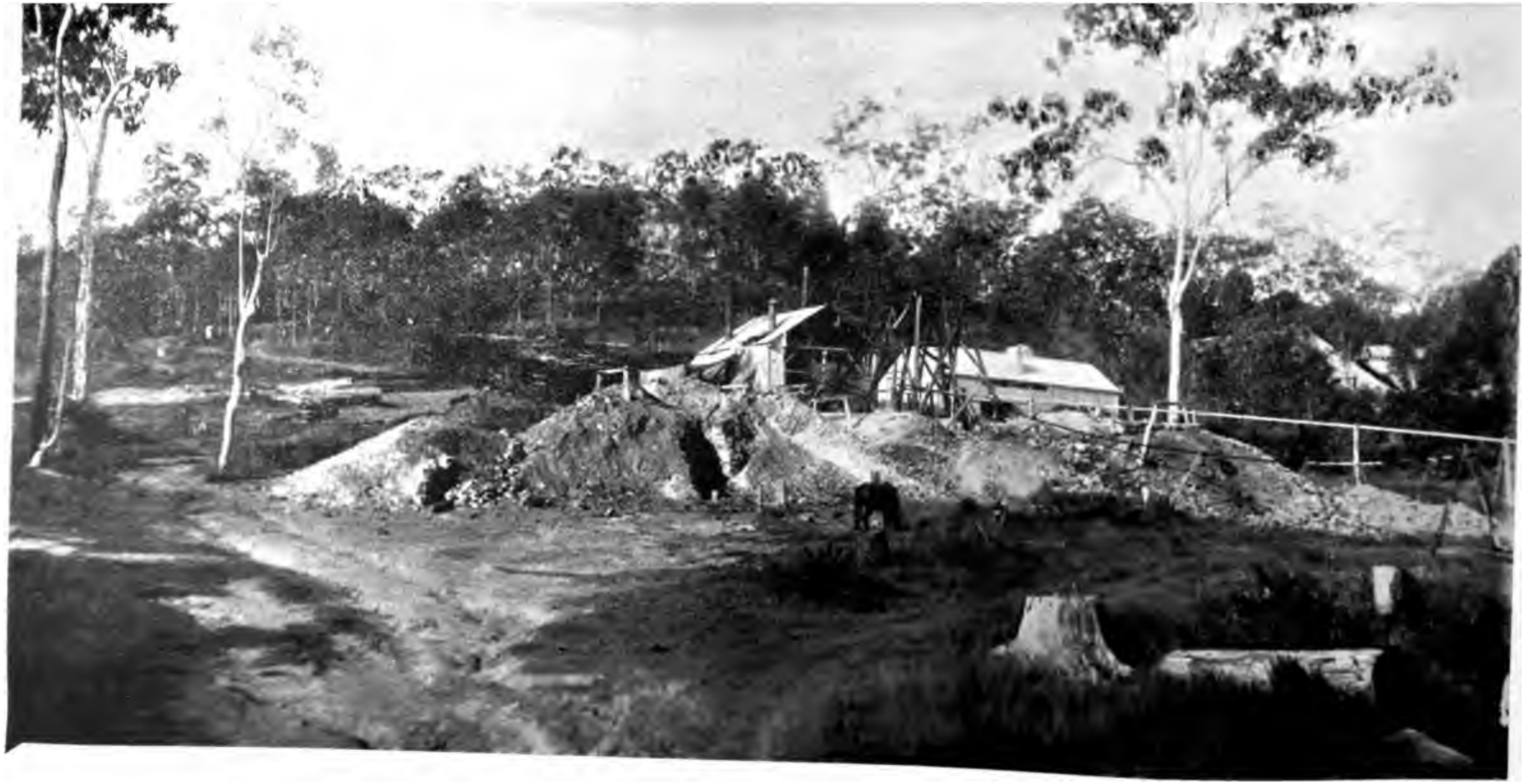
[*Photo. by B. Dunstan.*

PLATE 13.

View of the West Shaft, Great Fitzroy Mine. Looking North-east.

At the present time this is being used as a water shaft, the water being pumped to the elevated reservoir near the offices on the side of the hill close to "A" Shaft. The shaft is considered to be away from the main ore-body, being too far west.

Plate 13.



View of the West Shaft, Great Fitzroy Mine. Looking North-East.

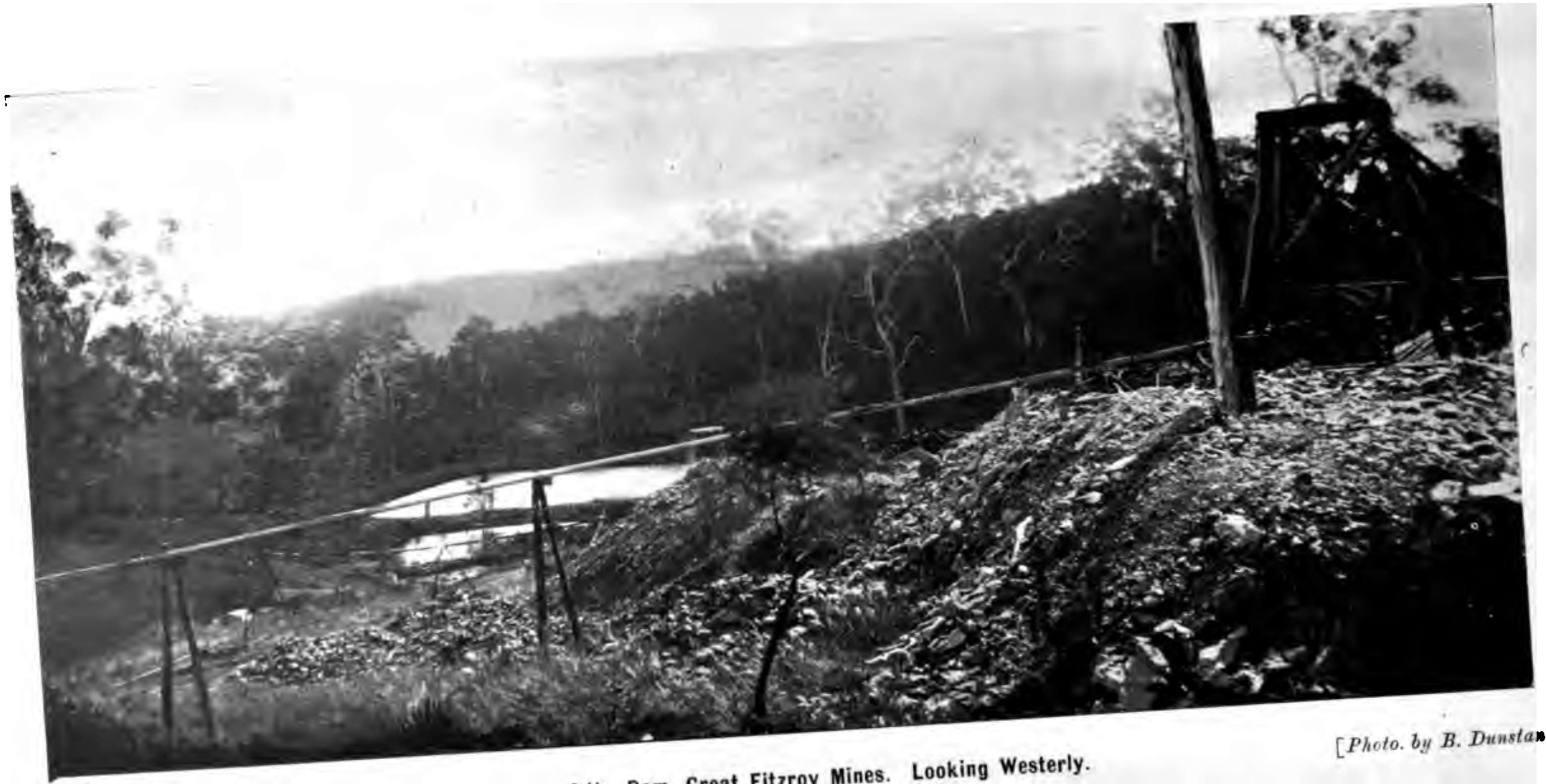
[*Photo. by B. Dunstan.*

PLATE 14.

View of the Dam, Great Fitzroy Mines. Looking Westerly.

This small reservoir receives the drainage from the hills around Mount Chalmers, and with the water from the West Shaft has been sufficient for all purposes up to the present time. Further water conservation will probably necessitate a reservoir lower down on Nankine Creek.

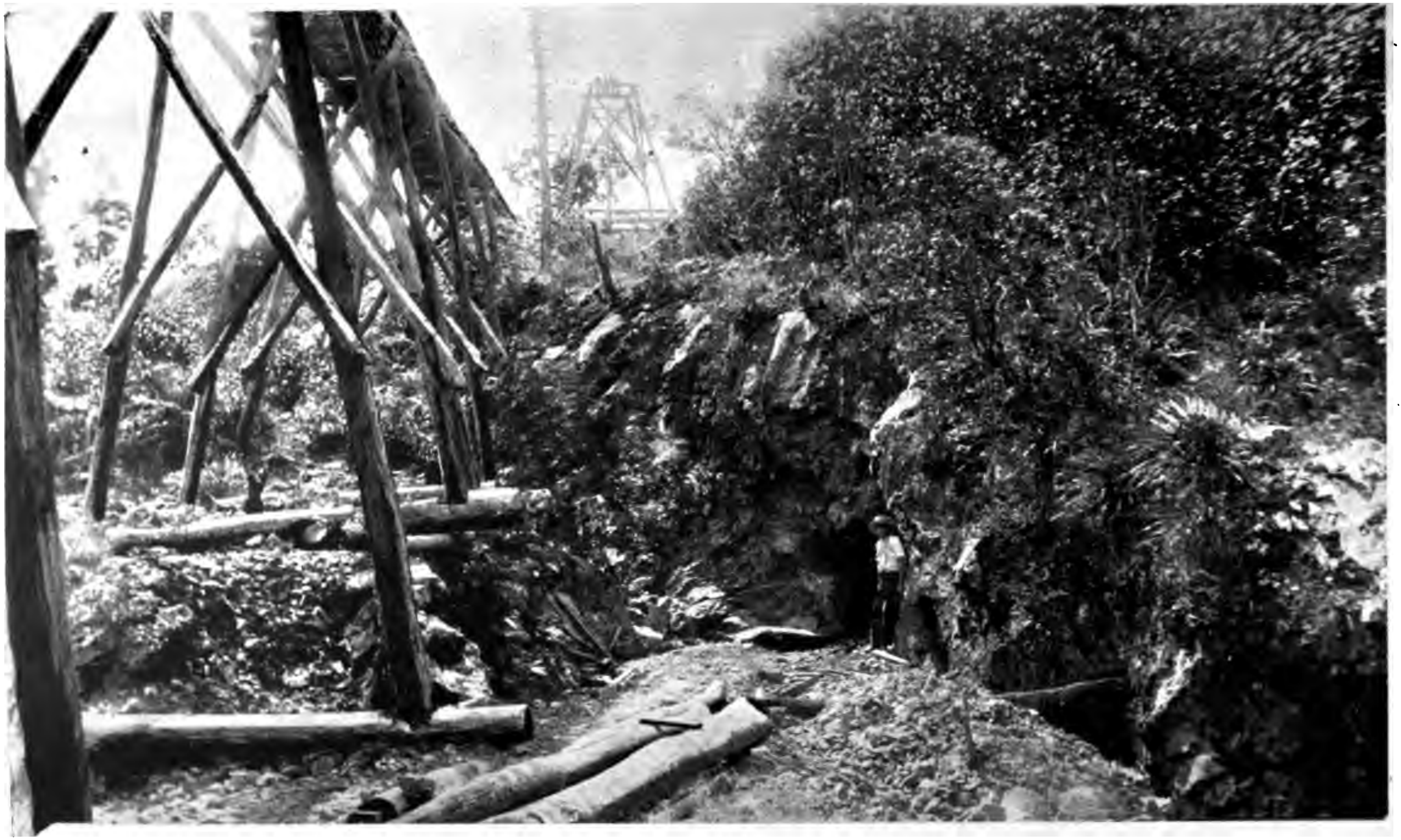
Plate 14.



[*Photo. by B. Dunstan.*

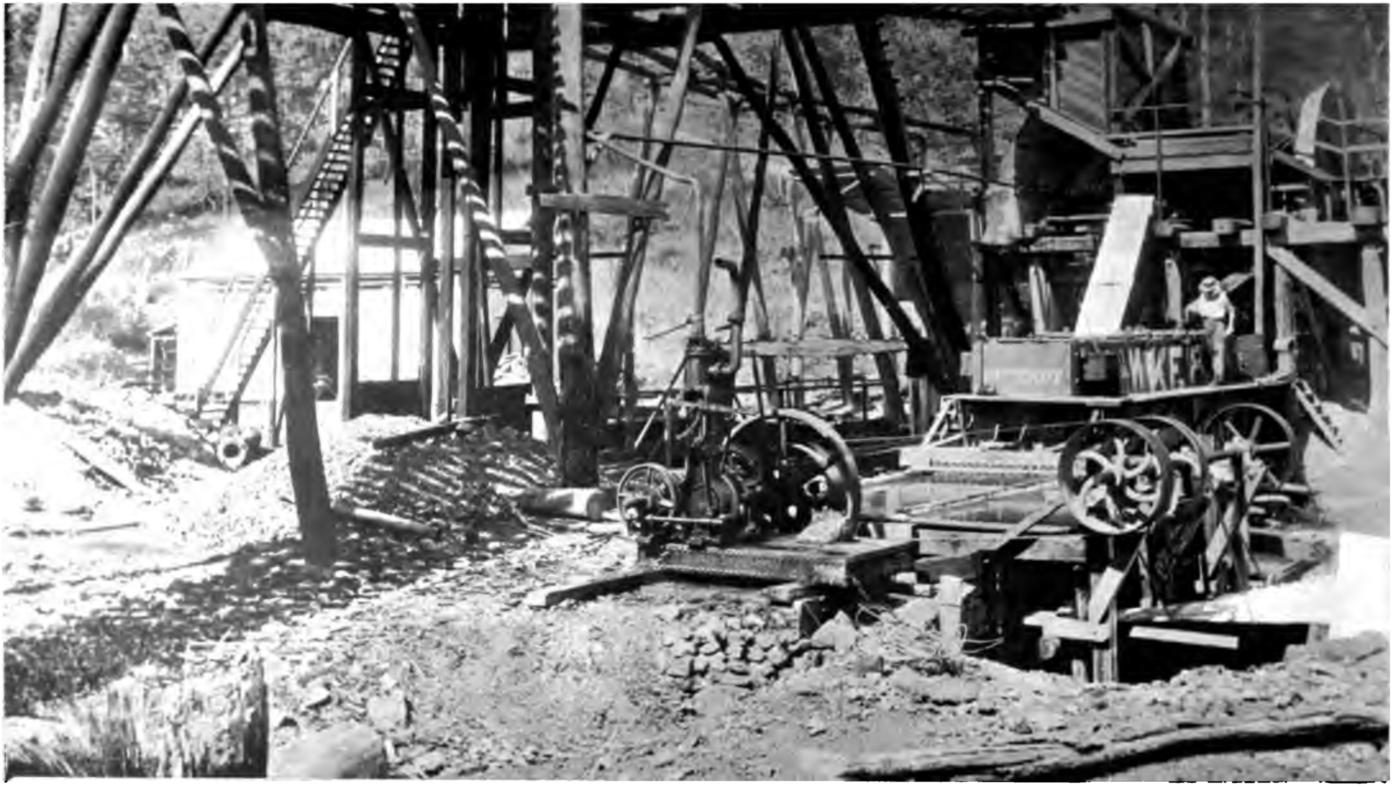
View of the Dam, Great Fitzroy Mines. Looking Westerly.

Plate 12.



View near Mouth of the Adit Level, Great Fitzroy Mine. Looking North. [*Photo. by B. Dunstan.*

Plate 15.



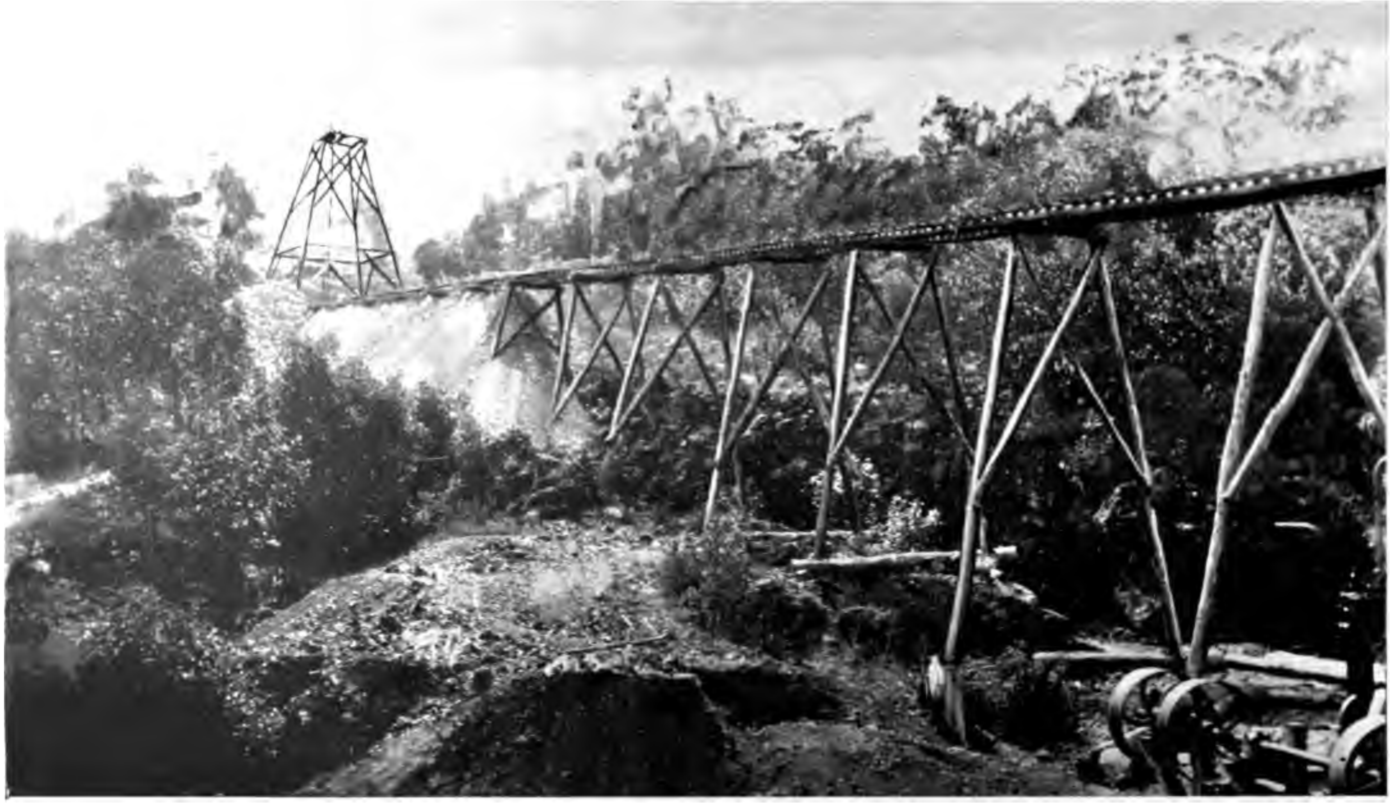
View of the Crushing and Concentrating Plant, Great Fitzroy Mine. [*Photo. by B. Dunstan.*

PLATE 16.

VIEW OF TRAMWAY, NORTH SHAFT, AND No. 1 OLD WORKINGS.

The tramway is inclined from the North Shaft, in the distance, and the No. 1 Old Workings are shown in the foreground on the left side. The Adit Level is on the right and the hill in the background is Osborne Hill.

Plate 16.



View of Tramway, North Shaft, and No. 1 Old Workings.

[*Photo by B. Dunstan.*

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